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JUČER, DANAS, SUTRA

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QUALITY -
YESTERDAY, TODAY, TOMORROW

16.-18. ožujka 2022.
March 16th-18th, 2022
Poreč Hrvatska/Croatia

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CROATIAN QUALITY MANAGERS SOCIETY

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TJELESNA PISMENOST U FUNKCIJI POBOLJŠANJA KVALITETE ŽIVOTA

PHYSICAL LITERACY IN FUNCTION OF IMPROVING THE QUALITY OF LIFE

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SAŽETAK

Redovita tjelesna aktivnost pomaže u prevenciji i liječenju nezaraznih bolesti kao što su bolesti srca, moždani udar, hipertenzija, dijabetes i nekoliko vrsta raka, u održavanju zdrave tjelesne težine te može poboljšati mentalno zdravlje i opću kvalitetu života, ukratko vježbanje je lijek. Tjelesna se neaktivnost smatra vodećim čimbenikom lošega zdravlja i Svjetska mu zdravstvena organizacija na području Europe i dijela Azije pripisuje oko 10% smrti i 8,3 milijuna godina života prilagođenih na nesposobnost (DALY). Štoviše, tjelesna je neaktivnost u porastu i to nije samo zdravstveni, nego i ekonomski problem. Rekreacija pozitivno utječe na poboljšanje tjelesnoga zdravlja te može poboljšati životne izgleda, ali i značajno smanjiti pritisak na javnozdravstvene proračune. Tjelesna pismenost relativno je nov, ali sve aktualniji pojam, predmet istraživanja i potreba povezana s općom kulturom, kvalitetom života, i ekonomskim čimbenicima javnoga zdravlja. Istraživanje za potrebe ovoga rada provedeno je analizom znanstvenih radova i drugih publiciranih podataka i informacija o povezanosti tjelesne aktivnosti, tjelesne pismenosti i zdravlja, odnosno kvalitete života, u potrazi za odgovorima na sljedeća pitanja: 1) koliko je tjelesna pismenost uključena u programe / sustave edukacije u Hrvatskoj i svijetu; 2) na koji se način i s kojim rezultatima promiče i potiče tjelesna aktivnost u Hrvatskoj; 3) treba li tjelesna aktivnost biti sastavni dio sustava upravljanja kvalitetom.

Ključne riječi: tjelesna pismenost, kvaliteta života, rekreacija, standardi, SUK.

1. UVOD

Tjelesna se aktivnost odnosi na svaki pokret tijela koji se izvodi aktivacijom skeletnih mišića, iz čega proizlazi potrošnja energije, obuhvaća sve kretanje u svakodnevnom životu, uključujući posao, prijevoz, kućanske poslove, rekreaciju i sportske aktivnosti, a kategorizirana je prema razini intenziteta, od niskog preko umjerenog do visokog.¹ Tjelesna se neaktivnost smatra vodećim čimbenikom lošega zdravlja i Svjetska mu zdravstvena organizacija² pripisuje oko 10% smrti i 8,3 milijuna godina života prilagođenih na nesposobnost (*Disability Adjusted Life Years, DALY*) na području Regije Europa³. Štoviše, tjelesna je neaktivnost u porastu⁴ i to nije samo zdravstveni, nego i ekonomski problem. Rekreacija pozitivno utječe na poboljšanje tjelesnoga zdravlja, te može poboljšati životne izgleda, ali i značajno smanjiti pritisak na javnozdravstvene proračune.⁵ Dokazano je da redovita tjelesna aktivnost pomaže u prevenciji i liječenju nezaraznih bolesti kao što su bolesti srca, moždani udar, dijabetes i nekoliko vrsta raka^{6,7,8} Također pomaže u prevenciji hipertenzije, održavanju zdrave tjelesne težine i može poboljšati mentalno

¹ World Health Organization, Physical activity strategy for the WHO European Region 2016-2025, Regional Committee for Europe 65th Session, 2015. [https://doi.org/978 92 890 5147 7](https://doi.org/978%2092%20890%205147%207)

² Ibid.

³ Regionalni ured Svjetske organizacije za Europu (WHO European Region) jedan je od 6 regionalnih ureda u svijetu. Regiju Europa čine 53 zemlje, članice EU i ostale na području od Atlantskog do Tihog oceana. (<https://www.euro.who.int/en/about-us>, pristupljeno 25.11.2021.).

⁴ Pedro C. Hallal, Lars Bo Andersen, Flona C. Bull, Regina Guthold, William Haskell, „Global physical activity levels: surveillance progress, pitfalls, and prospects“, *The Lancet* 380, 2012, pp 247-257.

<http://www.sciencedirect.com/science/article/pii/S0140673612606461>

⁵ Darren Moseley, Thomas Connolly, Louise Sing, Kevin Watts, „Developing an indicator for the physical health benefits of recreation in woodlands“. *Ecosystem Services*, 31, 2018, pp 420-432.

[doi:10.1016/j.ecoser.2017.12.008](https://doi.org/10.1016/j.ecoser.2017.12.008)

⁶ Jon P. Nicholl, Philip Coleman, John E. Brazier, „Health and Health care Costs and Benefits of Exercise“, *Pharmaco Economics*, Vol. 5, No. 2, 1994.

⁷ WHO (World Health Organization). 2004. „Promoting Mental Health: Concepts, Emerging Evidence, Practice: Summary Report.“ Accessed 22 November 2021. <https://apps.who.int/iris/bitstream/handle/10665/42940/9241591595.pdf>

⁸ James McKinney, Daniel J. Lithwick, Barbara N. Morrison, Hamed Nazzari, Saul H. Isserow, Brett Heilbron, Andrew D. Krahn, „The health benefits of physical activity and cardiorespiratory fitness“, *BC Medical Journal*, Vol. 58 No. 3, 2016, pp 131-137.

zdravlje i opću kvalitetu života, ukratko vježbanje je lijek.⁹ Ipak, trenutačne globalne procjene pokazuju da jedna od četiri odrasle osobe i 81% adolescenata nisu dovoljno tjelesno aktivni. Nadalje, kako se zemlje ekonomski razvijaju, razina neaktivnosti se povećava i može doseći čak 70%¹⁰, zbog promjene obrazaca prometa, povećane upotrebe tehnologije za rad i rekreaciju, kulturnih vrijednosti i sve većeg sjedilačkog ponašanja. Povećana razina tjelesne neaktivnosti negativno utječe na zdravstvene sustave, okoliš, gospodarski razvoj, dobrobit zajednice i kvalitetu života. Svjetska zdravstvena organizacija procijenila je da globalni trošak tjelesne neaktivnosti iznosi oko 54 milijarde američkih dolara izravne zdravstvene zaštite, uz još 14 milijardi dolara gubitka koji proizlazi iz izgubljene produktivnosti.¹¹ Tjelesna bi aktivnost trebala biti integrirana u svakidašnji život, kako privatni, tako i poslovni. Premda se deklarativno promovira pješaćenje i/ili vožnja bicikla, kao kvalitetnija zamjena za druge, pasivne oblike prijevoza (automobil, motocikl, autobus, tramvaj i dr.), njihova primjena u mnogim je zemljama u padu. Osim toga, urbana infrastruktura u mnogim gradovima nije prilagođena, nema biciklističkih staza, nogostupi su „okupirani“ parkiranim automobilima, spremnicima za otpad, stupovima rasvjete i dr. ili ih uopće nema. Također nedostaje uređenih javnih površina za rekreaciju, posebno onih prilagođenih različitim dobnim skupinama i dostupnih npr. osobama sa smanjenom pokretljivošću. Na globalnoj razini, takva infrastruktura mogla bi biti jedan od ključnih čimbenika turističke atraktivnosti destinacije, izvor novih radnih mjesta, inovacija, ali i društvene uključenosti, humanitarnih akcija i lokalnoga razvoja.¹² Sve više istraživanja ukazuje na to da rekreacija u prirodi pridonosi pozitivnim psihološkim ishodima, mentalnome zdravlju, spoznajnim sposobnostima, otpornosti i oporavku, kao i smanjenju tjeskobe, depresije i stresa.¹³ Mentalno je zdravlje stanje dobrobiti u kojemu osoba ostvaruje vlastite sposobnosti, može se nositi s normalnim životnim stresom, produktivno i plodno raditi, te dati

⁹ Gregory N. Ruegsegger, Frank W. Booth, „Health Benefits of Exercise“, *Cold Spring Harb Perspect Med* 2018. doi: 10.1101/cshperspect.a029694

¹⁰ WHO, 2018.

¹¹ Ibid.

¹² Ibid.

¹³ Nancy Lackey Qwynne, Deborah A. Tysor, David G. McNay, Leah Joyner, Kensey H. Baker, Camille Hodge, „Mental health benefits of nature-based recreation: a systematic review“, *Annals of Leisure Research*, 2019.

DOI: 10.1080/11745398.2019.1655459

doprinos svojoj zajednici.¹⁴ Tjelesna pismenost izraz je koji se odnosi s jedne strane na tjelesnu kompetenciju, motivaciju, samopouzdanje i znanje, a s druge strane na uvažavanje i preuzimanje odgovornosti za svrhovite tjelesne aktivnosti tijekom cijeloga životnog vijeka. Drugim riječima, pismenost tjelesne aktivnosti dovodi do potpunijeg razumijevanja i uvažavanja tjelesne aktivnosti kao osobne predanosti trajnom sastavnom dijelu vlastitog života.¹⁵ U školama ravnatelji i nastavnici planiraju, usmjeravaju i podržavaju sudjelovanje učenika u svrsishodnim, korisnim i sadržajnim tjelesnim aktivnostima. Međutim, pismenost tjelesne aktivnosti značajno je šira, uključuje osjetilnu percepciju fizičkog okruženja, predviđanje potreba ili mogućnosti kretanja i odgovarajući odgovor na njih uz pomoć inteligencije i mašte, čime se razvija samopoštovanje i samopouzdanje, neverbalna komunikacija i empatična interakcija s okolinom. Sve to pridonosi kvaliteti života, odnosno razumijevanju načela integriranog zdravlja, s uvažavanjem temeljnih pretpostavki kao što su vježbanje, spavanje i prehrana.¹⁶ Tjelesna se pismenost, kao višestruki koncept sastoji od afektivnih (motivacija i samopouzdanje), tjelesnih (fizička kompetencija), kognitivnih (znanje i razumijevanje) i bihevioralnih (uključenost u tjelesne aktivnosti za cijeli život) domena, koje zajedno utjelovljuju holistički pristup tjelesnoj aktivnosti uzimajući u obzir društvene procese povezane s cjeloživotnim učenjem.^{17,18,19} Mnogi modeli tjelesne pismenosti posvećeni su uglavnom razvoju sportske edukacije za djecu i mlade, poput sportskih organizacija Sport for Life Society, Physical Literacy for Life, Sport Australia, Sport England i Society of Health and Physical Educators (SHAPE

¹⁴ WHO (World Health Organization). "Promoting Mental Health: Concepts, Emerging Evidence, Practice: Summary Report", 2004.

Accessed 22 November 2021. <https://apps.who.int/iris/bitstream/handle/10665/42940/9241591595.pdf>

¹⁵ Margaret Whitehead, „The Value of Physical Literacy“, ICSSPE Bulletin number 65 I, p. 29 f., 2013.

https://www.icsspe.org/sites/default/files/bulletin65_0.pdf (28.11.21.)

¹⁶ Ibid.

¹⁷ Katie Cornish, Gloria Fox, Trina M. Fyfe, Erica Koopmans, Chelsea A. Pelletier „Understanding physical literacy in the context of health: a rapid scoping review“. BMC Public Health 20, 2020, p. 1569. <https://doi.org/10.1186/s12889-020-09583-8>

¹⁸ Dean Dudley, John Cairney, Nalda Wainwright, Dean Kriellaars, Drrew Mitchell, „Critical considerations for physical literacy policy in public health, recreation, sport, and education agencies“. Quest, Vol. 69, No. 4, 2017. pp 436-452.

¹⁹ Lisa Young, Justen O'Connor, Laura Alfrey, „Physical literacy: a concept analysis“, Sport Educ Soc., Vol. 25, No. 8, 2020, pp 946-959.

America) u Sjedinjenim Državama.²⁰ Jedna od važnih uloga lokalnih / nacionalnih zajednica jest da osiguraju dostupnost i pristup ponašanjima koja promiču zdravlje za sve pripadnike tih zajednica. Tjelesna aktivnost značajno pridonosi kvaliteti života pojedinca, ali i zajednice. Kvalitetu života kao koncept (*Quality of Life*, QOL) čini kompleksan skup čimbenika, pa stoga ne čudi da ne postoji jedinstvena definicija, standard ili mjerilo. Australijski Centar za kvalitetu života²¹ opisuje više od 1.200 mjerila, od kojih svako sadrži kombinaciju specifičnih zavisnih varijabli. Općenito je prihvaćeno da se subjektivan osjećaj dobrobiti može mjeriti osobnom percepcijom zadovoljstva, odnosno osjećaja o vlastitom stanju, npr. putem upitnika, odnosno pitanja kojima se traži da ispitanici ocijene svoje opće zadovoljstvo vlastitim životom. Zanimljiv je primjer kanadskoga projekta *24-Hour Movement Guidelines*, namijenjenoga kreatorima javnih politika, stručnjacima u području zdravstva, istraživačima i široj javnosti, a cilj mu je potaknuti odrasle u dobi od 18 do 64 godine, ali i sve ostale (starije i mlađe) na tjelesnu aktivnost. Na mrežnim stranicama²² nalaze se detaljne informacije i upute, te različiti motivacijski sadržaji. Indija, primjerice, putem Ministarstva AYUSH (*Ayurveda, Yoga, Unani, Siddha, Homoeopathy*) potiče edukaciju i primjenu tradicionalnih metoda aktivnosti, prehrane i cjelovitoga pristupa liječenju.²³ Očekivane su dobrobiti nakon uvođenja zdravih navika, promjena sjedilačkoga u tjelesno aktivan način života višestruke: niži rizik od kardiovaskularnih bolesti, povišenoga krvnog tlaka, dijabetesa, nekih oblika malignih bolesti, tjeskobe, depresije, demencije, pretilosti, zatim poboljšanje zdravlja kostiju, kognitivnih sposobnosti i cjelokupne kvalitete života. Redovita tjelesna aktivnost pomaže razvoju moždanih aktivnosti, poboljšanju pamćenja, koncentracije i mentalne oštine. Ključne kompetencije jedan su od temeljnih koncepata obrazovne politike Europske unije, a njihova je važnost prepoznata i unutar politika koje određuju hrvatski obrazovni sustav. Jedno od načela i ciljeva Zakona o Hrvatskom kvalifikacijskom okviru (NN 22/13) jest jačanje uloge ključnih kompetencija za cjeloživotno učenje, nužnih za uključenost u život zajednice, a obuhvaćaju komunikaciju na materinskom i na stranim jezicima, matematičku i osnovne kompetencije u prirodoslovlju i tehnologiji, digitalnu

²⁰ Katie Cornish, Gloria Fox, Trina M. Fyfe, Erica Koopmans, Chelsea A. Pelletier „Understanding physical literacy in the context of health: a rapid scoping review“. BMC Public Health 20, 2020, p. 1569. <https://doi.org/10.1186/s12889-020-09583-8>

²¹ International Wellbeing Group Personal Wellbeing Index: 5th Edition. Melbourne: Australian Centre on Quality of Life, Deakin University, 2013. <http://www.acqol.com.au/instruments#measures>

²² <https://www.participaction.com/en-ca/programs/community-challenge> (28.11.21.)

²³ <https://main.ayush.gov.in/background/> (28.11.21.)

i kompetenciju učiti kako učiti, zatim socijalnu i građansku kompetenciju, inicijativnost i poduzetnost te kulturnu svijest i izražavanje. Ne spominje se kompetencija vezana uz tjelesnu pismenost. Zakon o obrazovanju odraslih (NN 144/21) navodi kako odrasle osobe putem programa obrazovanja odraslih, uz znanje, vještine i sposobnosti za rad u struci, stječu i znanja i vještine pisanja i računanja, materinskog i stranih jezika, informacijsko-komunikacijske tehnologije, građanskih i socijalnih znanja i vještina, kao i poduzetničkih i kreativnih vještina. Ukratko, odraslim je osobama potrebna elementarna, funkcionalna, informatička, poduzetnička, globalna pismenost itd., ali ne i tjelesna pismenost. Hrvatskim nacionalnim programom „Živjeti zdravo“, čiji je cilj promicanje zdravih stilova života, unapređenje zdravlja stanovništva RH, te poboljšanje kvalitete života i demografske situacije u zemlji, obuhvaćena su 4 prioriteta područja: pravilna prehrana, tjelesna aktivnost, mentalno i spolno i reproduktivno zdravlje.²⁴ Visok udio stanovništva starijeg od 65 godina predstavlja značajan izazov za održivi razvoj društva u cjelini, ali i za zdravstveni sustav. Prema podacima Hrvatskoga zavoda za javno zdravstvo godišnje od bolesti srca i krvnih žila umire oko 25.000 osoba, a samo redovito hodanje kao tjelesna aktivnost smanjuje rizik obolijevanja od tih bolesti između 30 i 40%.²⁵ Svjetska zdravstvena organizacija i mnoge udruge liječnika preporučuju 60 minuta tjelesnog i zdravstvenog odgoja dnevno, čime se razvija niz vještina i kompetencija, omogućuje poboljšanje i jačanje veza unutar zajednice i obitelji, potiče razvoj pozitivnih društvenih stavova i ponašanja, kao i suživot s pripadnicima različitih kultura ili društveno-ekonomskih konteksta.²⁶ Tjelesna kultura i sport značajno pridonose društvu u kontekstu povećanja produktivnosti i jačanja participacije građana te društvene kohezije, smatraju se snažnim i vrlo učinkovitim sredstvima za razvoj, obrazovanje i učenje, razvoj životnih vještina, pozitivnih vrijednosti i odlika vođenja. Sport i rekreacija pomažu u izgradnji društva društvenom inkluzijom, osjećajem povezanosti, zajedničkim iskustvima i postignućima, te mogu spriječiti negativno društveno ponašanje. Na lokalnoj razini sportske aktivnosti povezuju ljude, bili oni sudionici, volonteri ili navijači, koji imaju priliku za društveni angažman, razvoj svjesnosti i prihvaćanje različitosti među pojedincima

²⁴ Ministarstvo zdravlja RH Nacionalni program „Živjeti zdravo“, 2015. <https://zdravstvo.gov.hr/UserDocsImages/Programi%20i%20projekti%20-%20Ostali%20programi/NP%20%C5%BDivjeti%20zdravo.pdf> (20.11.2021.)

²⁵ Ibid.

²⁶ Ana Žnidarec Čučković, *Inkluzivni i inovativni pristupi nastavi TZK-a i sportskom vježbanju; Priručnik dobre prakse*, broj 8, Vijeće Europe, 2018. https://mint.gov.hr/UserDocsImages/AAA_2020_MINTIS/sport_arhiva/EPAS_prirucnik_VE2018.pdf (28.11.21.)

i zajednicama.²⁷ Slijedom svega navedenoga postavlja se pitanje: treba li tjelesna pismenost/aktivnost biti standard i dio sustava upravljanja kvalitetom?

2. TJELESNA PISMENOST KAO STANDARD

U sklopu projekta Svjetske zdravstvene organizacije (SZO) „Zdravi gradovi“, koji se od 1988. godine odvijao se u fazama (aktualna 7. završava 2023. godine i povezana je s Agendom za održivi razvoj Ujedinjenih naroda) pokrenuto je i održava se niz inicijativa, među kojima i onih vezanih uz tjelesnu aktivnost stanovnika svjetskih urbanih cjelina. Zdravim se gradom definira onaj koji kontinuirano stvara i unaprjeđuje svoje fizičko i društveno okruženje, proširuje resurse zajednice i omogućuje ljudima da se međusobno podržavaju u obavljanju svih životnih funkcija i razvijanju maksimalnog potencijala. Zdrav grad nije onaj koji je postigao određeni zdravstveni status, on je proces, a ne ishod.²⁸ Ukratko, dovoljna je inicijativa, ali ne i mjerenje učinaka. Ne spominje se tjelesna aktivnost / pismenost kao strateška odrednica, vodič za tjelesnu aktivnost u zdravim gradovima.²⁹ Grad Pula, jedan od hrvatskih Zdravih gradova, pokrenula je niz inicijativa s ciljem promicanja i poticanja tjelesne aktivnosti, izgrađen je dio sportsko-rekreacijske infrastrukture, ali u izvješćima³⁰ nema podataka o učincima pokrenutih inicijativa i investicija. Dakle, Pula, poput stotina drugih gradova uključenih u projekt Zdravih gradova, može se deklarirati kao zdrav grad, bez obzira na aktualno zdravstveno stanje i bez obveze za praćenjem indikatora, odnosno mjerenjem. Osim poboljšanja zdravlja, gradovi koji ulažu u politike i programe tjelesne aktivnosti (uključujući aktivni prijevoz) mogu uštedjeti novac na zdravstvenoj skrbi i uslugama prijevoza, imati produktivnije građane, biti ugodniji za život i privlačniji stanovnicima, poslodavcima i posjetiteljima, imati manje onečišćenja zraka i buke, bolji pristup zelenim površinama, poboljšati soci-

²⁷ Ibid.

²⁸ <https://www.euro.who.int/en/health-topics/environment-and-health/urban-health/who-european-healthy-cities-network/what-is-a-healthy-city>, (28.11.21.).

²⁹ Peggy Edwards, Agis D. Tsouros, „A healthy city is an active city: a physical activity planning guide“, WHO Europe, 2008. <https://www.euro.who.int/en/health-topics/environment-and-health/urban-health/publications/2008/healthy-city-is-an-active-city-a-a-physical-activity-planning-guide> (20.11.2021.)

³⁰ Slika zdravlja Grada Pule 2014. s odabranim prioritetnim područjima za izradu Plana za zdravlje grada Pule 2015. - 2018. <http://www.zdravi-gradovi.com.hr/media/1278/gradska%20slika%20zdravlja%20-%20pula.pdf> (28.11.21.)

jalnu koheziju i identitet zajednice.³¹ U razvijenim zemljama tjelesna neaktivnost je vodeći čimbenik rizika za loše zdravlje. Oblici prijevoza koji podrazumijevaju tjelesnu aktivnost, poput vožnje bicikla i hodanja, odvojeno ili u kombinaciji s javnim prijevozom, nude značajne pozitivne zdravstvene koristi. Planiranje i donošenje odluka, međutim, često su ih zanemarivali. Više od 30% putovanja automobilom u Europi pokriva udaljenosti manje od 3 km, a čak 50% pokriva manje od 5 km. Te se udaljenosti mogu prijeći za 15-20 minuta biciklom ili 30-50 minuta brzoga hodanja. U EU su mnoga putovanja kratka i za većine se koristi automobil, uslijed čega je, među ostalim, 30% odraslih nedovoljno aktivno tijekom tipičnog tjedna, te se prevalencija pretilosti povećala za 10-40% između kasnih 1980-ih i kasnih 1990-ih. Stoga su postavljena 4 strateška cilja globalnoga zdravlja: stvaranje aktivnih društava, aktivnog okruženja, aktivnih ljudi i aktivnih sustava.³² Standardi kvalitete, poput ISO 9001:2015, temelj su za uspostavljanje sustava i upravljanje kvalitetom, upućuju organizacije da definiraju ciljeve, resurse, aktivnosti, odgovornosti, mjerila i kontinuirano poboljšavaju svoje SUK.

³¹ Peggy Edwards, Agis D. Tsouros, „A healthy city is an active city: a physical activity planning guide“, WHO Europe, 2008. <https://www.euro.who.int/en/health-topics/environment-and-health/urban-health/publications/2008/healthy-city-is-an-active-city-a-a-physical-activity-planning-guide> (20.11.2021.)

³² WHO, 2018.

Slika 1. Prijedlog modela SUK za Zdravi grad Pulu



Izvor: autorica prema ISO 9001:2015.

Primjena navedenoga standarda u kontekstu poboljšanja tjelesne pismenosti mogla bi se provoditi u sklopu projekta „Zdravi gradovi“, te pridonijeti upravo ostvarenju strateških ciljeva globalnoga zdravlja. Slika 1 nudi prijedlog modela SUK za Zdravi grad Pulu, a Tablica 1 prijedlog standarda i sustava indikatora tjelesne pismenosti.

Tablica 1. Prijedlog standarda i sustava indikatora tjelesne pismenosti

Standard 1: tjelesno pismena osoba pokazuje kompetencije u raznim motoričkim vještinama i obrascima kretanja		
Razina	Kompetencije	Indikatori
V, OŠ, SŠ, VO*	sport, igre, rekreacija, fitness, joga	razvijene lokomotorne i manipulativne vještine
V, OŠ, SŠ, VO*	ples, kretanje, ritmika	razvijene lokomotorne i manipulativne vještine, kreativno izražavanje pokretom, socijalne vještine
O, SD*	sport, igre, rekreacija, fitness, joga kao cjeloživotne aktivnosti	razvijene lokomotorne i manipulativne vještine, kreativno izražavanje pokretom, socijalne vještine
Standard 2: tjelesno pismena osoba pokazuje znanje i vještine za postizanje i održavanje razine tjelesne aktivnosti i kondicije koja poboljšava zdravlje		
Razina	Kompetencije	Indikatori
V, OŠ, SŠ, VO*	planiranje tjelesnih aktivnosti	razvijene tjelesne aktivnosti koje pozitivno utječu na zdravlje
O, SD*	navike/ponašanje usmjereni cjeloživotnom poboljšanju zdravlja	razvijene zdrave navike tjelesne aktivnosti
Standard 3: tjelesno pismena osoba pokazuje odgovorno osobno i društveno ponašanje tako da poštuje sebe i druge		
Razina	Kompetencije	Indikatori
V, OŠ, SŠ, VO*	samosvijest i upravljanje osobnim napredovanjem	razvijene pozitivne značajke osobnosti
V, OŠ, SŠ, VO*	društvena odgovornost i socijalne vještine	razvijene socijalne vještine i sposobnost za odgovorno ponašanje
O, SD*	odgovornost, etičnost	razvijena sposobnost za etično donošenje odluka
Standard 4: tjelesno pismena osoba prepoznaje vrijednost tjelesne aktivnosti za opće zdravlje, uživanje, kao izazov, oblik samoizražavanja i/ili društvenu interakciju		
Razina	Kompetencije	Indikatori
V, OŠ, SŠ, VO*	opće zdravlje	razvijena sposobnost analize dobiti povezanih s odabranim aktivnostima
V, OŠ, SŠ, VO*	izazov, upornost	razvijena sposobnost vrednovanja izazova i odabranih aktivnosti
O, SD*	uživanje, samoizražavanje, društvena interakcija	razvijena sposobnost uživanja, samoizražavanja i društvene interakcije u tjelesnim aktivnostima
Standard 5: tjelesno pismena osoba prepoznaje mogućnosti za razvoj vlastite karijere i upravlja osobnim i društvenim resursima povezanim s tjelesnom aktivnošću i kondicijom radi postizanja i održavanja opće dobrobiti		
Razina	Kompetencije	Indikatori
V, OŠ, SŠ, VO*	upravljanje osobnim i resursima zajednice	razvijena sposobnost vrednovanja osobnih i resursa zajednice povezanih s tjelesnom aktivnošću
O, SD*	planiranje i razvoj karijere	razvijene sposobnosti planiranja, provedbe i analize utjecaja tjelesne aktivnosti na osobnu i dobrobit zajednice (npr. smanjenje bolovanja)

Izvor: autorica prema: New York State Physical Education Learning Standards, SHAPE America, <https://www.shapeamerica.org/standards/pe/> (28.11.21.)

NAPOMENA: * V – vrtić; OŠ – osnovna škola; SŠ – srednja škola; VO – visoko obrazovanje; O – odrasli; SD – starija dob (65+)

U modelu prikazanom u Tablici 1. mogu se pratiti Razina obrazovanja (dob), Kompetencije pridružene odgovarajućoj razini obrazovanja i dobi te pripadajući indikatori Indikatori tjelesne pismenosti.

3. ZAKLJUČAK

Prema podacima SZO tjelesna se neaktivnost smatra vodećim čimbenikom lošega zdravlja i uzročnikom nesposobnosti za aktivan život. Štoviše, tjelesna je neaktivnost u porastu i nije samo zdravstveni, nego i ekonomski problem. Tjelesna pismenost izraz je koji se odnosi s jedne strane na tjelesnu kompetenciju, motivaciju, samopouzdanje i znanje, a s druge strane na uvažavanje i preuzimanje odgovornosti za svrhovite tjelesne aktivnosti tijekom cijeloga životnog vijeka. Sve to pridonosi kvaliteti života, odnosno razumijevanju načela integriranog zdravlja. U sustavu obrazovanja promiče se i potiče tjelesna aktivnost, ali to očito nije dovoljno za opću tjelesnu pismenost i aktivan pristup zdravlju i kvaliteti života. Projekt SZO „Zdravi grad“ ne obvezuje lokalne zajednice na mjerenje učinaka akcija koje provode s ciljem promicanja i poticanja (među ostalim) tjelesne aktivnosti svojih stanovnika, a nema ni spomena tjelesne pismenosti kao strateške odrednice. U radu se predlaže model SUK prema normi ISO 9001:2015 za Zdravi grad Pulu i pet standarda s pripadajućim nizom indikatora tjelesne pismenosti. Naime, strateški pristup tjelesnoj pismenosti u okviru sustava upravljanja kvalitetom omogućio bi planiranje, provedbu, mjerenje i kontinuirano poboljšavanje zdravstvene slike grada poput Pule.

Abstract:

PHYSICAL LITERACY IN FUNCTION OF IMPROVING THE QUALITY OF LIFE

Regular physical activity helps prevent and treat non-communicable diseases such as heart disease, stroke, hypertension, diabetes, and several cancers, maintain a healthy weight. It can also improve mental health and overall quality of life, in short exercise is a cure. Physical inactivity is considered a leading factor in ill health and is attributed to the World Health Organization in Europe and parts of Asia about 10% of deaths and 8.3 million disability-adjusted life years (DALY). Moreover, physical inactivity is on the rise, and it is not only a health but also an economic problem. Recreation has a positive effect on improving physical health, and can improve life prospects, but also significantly reduce the pressure on public health budgets.

Physical literacy is a relatively new but increasingly relevant concept, subject of research and a need related to general culture, quality of life, and economic factors of public health. The research for the purpose of this article was conducted by analysing scientific papers and other published data and information regarding the relationship between physical activity, physical literacy and health, or quality of life, in search of answers to the following questions: 1) how much is physical literacy included in education programs in Croatia and worldwide; 2) in what way and with what results physical activity is promoted and encouraged in Croatia; 3) whether physical activity should be an integral part of the quality management system.

Key words: physical literacy, quality of life, recreation, standards, QMS.

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PERCEPCIJA KVALITETE U KONTEKSTU PANDEMIJE COVID-19

PERCEPTION OF QUALITY
IN THE CONTEXT OF THE COVID-19 PANDEMIC

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SAŽETAK

Pandemija korona virusa (COVID-19) koja se pojavila u 2019/2020 godini nova je respiratorna bolest. Više nego i jedna pandemija u novijoj povijesti utjecala je na globalno gospodarstvo. Osim borbe za zdravlje ljudi, sve zemlje poduzimale su mjere za ublažavanje negativnih ekonomskih posljedica. Unutar ovog okvira, poduzete su brojne mjere za smanjenje poremećaja u tokovima robe i lancima opskrbe, kao i na pružanje usluga. Pandemija, kao globalni fenomen, nužno ima utjecaj na sve aspekte života ljudi na planeti. Pandemija je promijenila interese i zahtjeve građana širom svijeta, njihove prioritete kao i poimanje kvalitete. Utjecala je i na potrebu fleksibilnog tumačenja pojedinih koncepata kvalitete kao što su npr. Just in Time (JIT), ispunjavanje zahtjeva korisnika i dr. Tumačenje načela upravljanja kvalitetom također zahtijeva fleksibilan pristup. U ovom radu autor, primjenom znanstvenih metoda spoznaje, istražuje pandemiju korona virusa COVID-19 kao okolnost koja je promijenila globalni kontekst te njezin utjecaj na percepciju fenomena kvalitete kojeg se razumijeva kao poslovnu filozofiju, pragmatički pristup i način življenja.

Ključne riječi: kvaliteta, percepcija kvalitete, COVID-19 pandemija.

1. UVOD

Pandemija korona virusa (COVID-19) u 2019/2020 nova je respiratorna bolest. Prvi se put pojavila krajem prosinca 2019. u Wuhanu, kineskoj pokrajini Hubei. U siječnju 2020. godine razvila se u epidemiju u Narodnoj Republici Kini i proširila se po cijelom svijetu. Pokrenuo ju je dosad nepoznati virus SARS-CoV-2. Kako bi spriječila širenje, Svjetska zdravstvena organizacija (WHO) proglasila je međunarodno izvanredno stanje 30. siječnja 2020., no već 11. ožujka 2020. WHO je službeno proglasila pandemiju zbog brzog širenja virusa u cijelom svijetu i visokog rizika. Dvadeset dana nakon što je globalna pandemija službeno proglašena, zahvaćene su sve zemlje EU/EEA i više od 150 zemalja svijeta.¹

Zemlje diljem svijeta sve više prihvaćaju pojačane sigurnosne mjere: uključujući zatvaranje granica, zatvaranje zračnih luka, nametanje ograničenja putovanja, ograničavanje kretanja, samoizolaciju ili karantenu oboljelih.² Epidemija COVID-19 pogađa sve segmente društva, a posebno je štetna za pripadnike najosjetljivijih društvenih skupina kao što su starije osobe, kronični bolesnici od drugih bolesti i dr.³ Pandemija je također otvorila veliku dilemu izbora strategije zaštite života građana ili zaštite gospodarstva od teške ekonomske krize koja bi se mogla dogoditi uslijed zaustavljanja proizvodnje, poremećaja u odvijanju lanaca opskrbe i izostanka turističkih putovanja na globalnoj razini. Zbog nove gospodarske situacije stvorena je COVID Globalna zajednička platforma (COVID Global Action Platform) kako bi okupila poslovnu zajednicu za zajedničko djelovanje, zaštitila živote ljudi i omogućila kontinuitet poslovanja te osigurala podršku za odgovor na pandemiju COVID-19.⁴ U vrijeme pisanja ovog teksta u svijetu je bilo 663.001.898 zaraženih, 6.707.959 ljudi je umrlo i 13.107.022.929 doza cjepiva je iskorišteno.⁵ Broj oboljelih i dalje raste, kao i broj umrlih, a konačne posljedice teško je predvidjeti.

¹ European Centre for Disease Prevention and Control; Event background COVID-19, (pristup 19.4.2021.).

² World Economic Forum, url:<https://www.weforum.org/agenda/2020/03/why-lock-downs-work-epidemics-coronavirus-covid19/>, (pristup 19.4.2021.).

³ United Nations: Department of Economic and Social Affairs Social Inclusion; Everyone Included: Social Impact of COVID-19, url: <https://www.un.org/development/desa/dspd/everyoneincluded-covid-19.html>, (pristup 19.4.2020).

⁴ OECD, url: <https://www.oecd.org/coronavirus/en/>, (pristup 19.4.2020).

⁵ <https://www.who.int/emergencies/diseases/novel-coronavirus-2019> (pristup 18.1.2023.).

2. PROMJENE IZAZVANE PANDEMIJOM COVID-19

Širom svijeta vlade i poslovni subjekti tražili su rješenje kako ublažiti posljedice pandemije, prije svega kako zaštititi ljude i smanjiti oboljenja i smrtnost te kako osigurati odvijanje poslovnih aktivnosti kako svijet ne bi ušao u ekonomsku krizu koja bi mogla izazvati nestašice vitalnih proizvoda, izazvati konflikte i oružane sukobe nesagledivih posljedica. Budući da je pandemija utjecala na sva područja poslovnog i privatnog života građana diljem svijeta, nužno je utjecala i na promjene dotadašnjeg načina rada, navika, prioriteta, privatnog života. Kada je riječ o poslovanju, drastične promjene dogodile su se osobito u ovim sektorima:⁶

1. *Automobilska industrija* – predviđalo se da će poremećaj izazvan pandemijom uništiti 100 milijardi US\$ profita automobilske industrije te se očekivalo da će prodaja pasti za 20 do 30% u 2020. godini. No proizvođači automobila već su se suočavali s poremećajima prije COVID-a, uključujući automobile bez vozača, automatizirane tvornice i dijeljenje prijevoza, što je ojačalo automobilsku industriju i učinilo je relativno otpornom na krize.
2. *Restorani* – objedovanje u zatvorenom prostoru u restoranima bilo je prekinuto, a kasnije i znatno ograničeno i nije se znalo kad će se vratiti na razinu prije krize. Za vlasnike i upravitelje restorana s punom uslugom to znači razvoj novog dugoročnog ekonomskog modela. Postoje prilike za optimiziranje operacija preuzimanja i isporuke te reinženjering jelovnika i cijena. To može uključivati pronalaženje prave ravnoteže između posebnih ponuda i proizvoda koji podnose višu cijenu.
3. *Bankarske usluge* – u bankarskom se poslovanju mnogo toga promijenilo. Upravljanje rizikom koje je u bankama i do tada bilo razvijeno, dobilo je novu dimenziju u prevenciji loših kredita. Kako bi se spriječili gubitci osmišljeni su novi proizvodi kao npr. izračun kreditne sposobnosti za tvrtke pomoću softvera, umjesto da zaposlenici donose te odluke. Procjenjuje se da bi se na taj način mogle povećati marže za 5-10%.
4. *Industrija osiguranja* – spajanja i akvizicije – posebno u području “insurtech” (tehnologija osiguranja) – postaje ključna strategija za tradicionalne osiguravatelje. „Insurtechs“ i „fintechs“ (financijske tehnološke tvrtke) bile su među onima koje su najviše reagirale

⁶ Prema: World Economic Forum, <https://www.weforum.org/agenda/2020/11/covid-19-innovation-business-healthcare-restaurants/> (pristup 19.1.2021.).

na klijente tijekom krize COVID-19 i bile su prve koje su lansirale proizvode usmjerene na prilagodbu promjenama konteksta uslijed pandemije. Npr., jedan kineski „insurtech“ je nakon samo nekoliko mjeseci na tržište plasirao niz takvih proizvoda koji su obuhvatili gotovo 15 milijuna ljudi.

5. *Zdravstvo* – pandemija je značajno ubrzala rast digitalne zdravstvene skrbi. U 2019. 11% američkih korisnika koristilo je telezdravstvo. U 2020. godini ga 46% koristi kao zamjenu za otkazane posjete liječniku. Indijske bolnice Apollo, koje se sastoje od više od 7.000 liječnika i 30.000 drugih zdravstvenih djelatnika, pokrenule su digitalnu zdravstvenu aplikaciju, Apollo 24/7, početkom 2020. Unutar šest mjeseci aplikaciju je uključilo četiri milijuna ljudi, s oko 30.000 preuzimanja dnevno. Javno-privatna partnerstva također dobro funkcioniraju i imaju potencijal utjecati na budućnost zdravstva. Pacijenti traže online opcije terapije, kao što se vidi u trendovima Google pretraživanja. Postoje brojne tvrtke poput Genoa Telepsychiatry i BetterHelp koje nude ove usluge, a koje će vjerojatno biti još više korištene u budućnosti. Iako fizički pregled ostaje važan aspekt liječničkih posjeta, mnogi medicinski problemi mogu se dijagnosticirati i rješavati virtualno. Budući da virtualni posjeti liječniku skraćuju vrijeme čekanja, probleme s prijevozom i individualne probleme mobilnosti, telemedicina će vjerojatno biti sve više uključena u rutinsku medicinsku skrb i nakon pandemije.
6. *Obrazovanje* – obrazovni sustav posebno je teško pogođen pandemijom s mogućnostima kućne škole i virtualnog kurikuluma koji u posljednje vrijeme postaju sve više prihvaćeni. Pandemija je pojačala postojeće izazove u vezi s uključenošću, nejednakostima i stopama prekida školovanja. Npr., studenti s nižim primanjima imaju 55% veću vjerojatnost da će kasnije diplomirati zbog krize COVID-19 nego njihovi vršnjaci s višim primanjima. S online i učenjem na daljinu koje je bilo prisutno tijekom pandemije, obrazovne organizacije imaju priliku koja se pruža jednom u generaciji, da promijene strukturu fizičkog i virtualnog prostora. Važno je prepoznati da virtualni kurikulum neće biti zamjena za nastavni plan i program unutar razreda. Međutim, nakon pandemije, vjerojatno je da će se ovi virtualni obrazovni resursi nastaviti koristiti, jer visokokvalitetni virtualni kurikulum može pomoći u premošćivanju razlika u kvaliteti obrazovanja u javnim školama i pomoći učenicima da ostvare svoj potencijal. Svjetski ekonomski forum vidi ove promjene kao

globalne i dugotrajne, s obzirom na prisutne obrazovne razlike i rastuću sveprisutnost pristupa internetu i mobilnim podacima.

7. *Putovanja* – pandemija se učinkovito proširila zbog stupnja globalizacije i lakoće putovanja. Dok su ograničenja putovanja tijekom pandemije posebno stroga, s ograničenim kapacitetom zrakoplova i zahtjevima za nošenjem maski, vjerojatno će određeni preventivni protokoli biti na snazi i u budućnosti. Zrakoplovna industrija izgubila je tijekom pandemije više od 30 milijardi US\$. Dok mjere opreza poput letova s ograničenim kapacitetom mogu biti dugoročno financijski neodrživi, druge intervencije poput poticanja univerzalnog nošenja maski jednostavna su mjera opreza za smanjenje lakog širenja bolesti. Hoteli su započeli s taktikom temeljite sterilizacije, uključujući bez kontaktne procese i stroža ograničenja u broju gostiju, što je operativna promjene koje će se vjerojatno nastaviti i nakon završetka pandemije. Ograničenja povezane s pandemijom izazvala su 2020. privremeni pad zagađenja zraka širom planete, osobito u metropolama, zaključila je UN-ova agencija, Svjetska meteorološka organizacija (WMO).
8. *Radno mjesto* – pandemija je prisilila pojedince i tvrtke diljem svijeta da prijeđu na rad na daljinu koristeći usluge, kao što su Zoom, Teams, Skype, Slack, Microsoft Office Suite i G-Suite aplikacije. Ova situacija prisiljava tvrtke da preispitaju svoje dugoročne potrebe za radnicima. Nastavkom omogućavanja rada od kuće, tvrtka može smanjiti troškove infrastrukture iznajmljivanjem manjih radnih prostora, postavljanjem sjedišta u državama s nižim porezima i koordinacijom radne snage u više vremenskih zona kako bi se povećao dnevni tijek rada. Štoviše, prednosti rada od kuće su atraktivne, uključujući povećanu fleksibilnost rasporeda i smanjeni napor. Pritom će se morati postići odgovarajuća ravnoteža na način da se izbjegnu problemi koji proizlaze iz kulture rada od kuće, kao što su usamljenost i smanjeni osjećaj za prijateljstvo te kultura tvrtke. U globalnoj studiji više od 40% ljudi koji rade od kuće reklo je da im je mentalno zdravlje pogoršano od izbijanja COVID-19, što može smanjiti produktivnost i rezultirati fluktuacijom zaposlenih. Rad od kuće bit će jedan od kriterija za napredovanje zaposlenika za razliku od vremena prije pandemije. Neke zemlje, među kojima i Hrvatska, rad od kuće, odnosno rad na izdvojenom mjestu rada i rad na daljinu, regulirale su zakonom.⁷

⁷ *Zakon o izmjenama i dopunama Zakona o radu*, Članak 7. i 8. (NN 151/22).

9. *Sport* – u sportu su se tijekom pandemije dogodile velike promjene, od potpunog odgađanja sportskih natjecanja, održavanja natjecanja bez prisustva publike ili uz ograničeni broj gledatelja ovisno o kapacitetima sportskog objekta i dr. Odgađana su i najveća svjetska natjecanja poput Olimpijskih igara (OI) u Tokiju. Zajedničkom odlukom Međunarodnog olimpijskog odbora (MOO) i japanskih vlasti, odlučeno je da se OI neće moći održati u predviđenom terminu od 24. srpnja do 9. kolovoza 2020. godine zbog pandemije korona virusa. MOO i japanski organizatori objavili su plan da će se Igre održati najkasnije u ljeto 2021. godine, kako su i održane. Sportski savezi su, u suradnji na nacionalnim stožerom i Ministarstvom zdravstva donijeli brojne procedure koje su trebale omogućiti nastavak sportskih natjecanja.
10. *Obiteljski život* – pandemija korona virusa (COVID-19) promijenila je svijet. Otkako se virus pojavio promijenio je svakodnevne živote diljem svijeta. Pandemija je promijenila način rada, obrazovanja i komunikacije jer su smjernice o socijalnom distanciranju dovele do virtualnijeg života, osobnog i poslovnog. Istraživanje, koje su naručili časopis Parade i klinika Cleveland, otkriva da je pandemija promijenila način na koji Amerikanci pristupaju svom zdravlju i zdravstvenoj skrbi na pozitivne i negativne načine.⁸ Ne iznenađuje da je pandemija pokrenula val problema s mentalnim zdravljem. Bilo da se radi o upravljanju ovisnošću, depresiji, društvenoj izolaciji ili samo o općem stresu koji je posljedica COVID-19, svi ga osjećaju. Čini se da posebno pogađa mlade ljude. Od anketiranih, 55% je izjavilo da ima problema s mentalnim zdravljem od početka pandemije, uključujući 74% ispitanika u dobi od 18 do 34 godine. Od tih ispitanika, četiri najčešća pitanja bila su:⁹ 1) Stres (33% ukupno; 42% od 18 do 34 godine); 2) Anksioznost (30% ukupno; 40% osoba od 18 do 34 godine); 3) Depresija (24% sveukupno; 31% osoba od 18 do 34 godine) i 4) Usamljenost ili izolacija (24% ukupno; 31% osoba od 18 do 34 godine). Mnogi se također osjećaju preopterećeni stalnim, ponekad promjenjivim i proturječnim protokom informacija o virusu i pandemiji. Sveukupno, 41% ispitanih tvrdi da su bili toliko opterećeni vijestima i informacijama o COVID-19 da nisu obraćali pozor-

⁸ Cleveland Clinic, Health essentials, <https://health.clevelandclinic.org/heres-how-the-coronavirus-pandemic-has-changed-our-lives/> (pristup 20.1.2021).

⁹ Ibid.

nost. Tijekom cijele pandemije vidjele su se prednosti i nedostaci dugotrajne povezanosti s obitelji. A tu je svakako i dodatni stres za obitelji koje su se morale nositi sa situacijama učenja na daljinu za djecu školske dobi. Neki su ipak izvijestili o pozitivnim iskustvima sa svojim obiteljima u tako bliskom okruženju.¹⁰ Sveukupno, 34% onih koji su odgovorili reklo je da se osjećaju bliže svojoj obitelji, a u kućanstvima s djecom, 52% je izjavilo da se osjećaju kao da su uspostavili nove veze. Osim toga, 78% se složilo da ih je karantena natjerala da cijene svoje veze. Od ukupnog broja 27% ispitanih koji imaju djecu rekli su da su njihova djeca imala koristi od toga što mogu više vremena provoditi s obitelji.¹¹

3. PROMJENE NA PRIVATNOM I PROFESIONALNOM PLANU

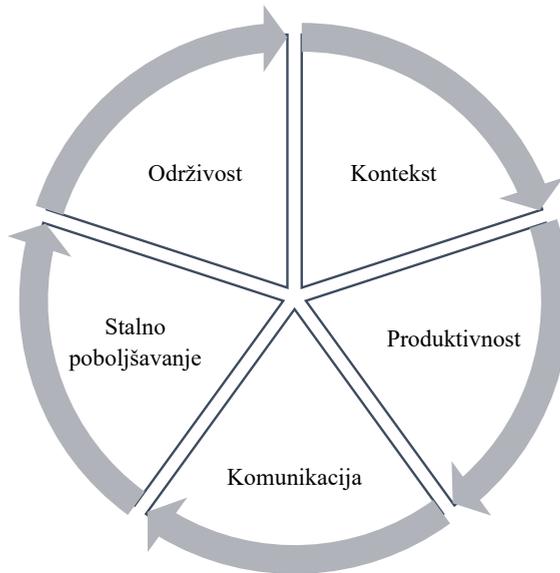
Od većine organizacija se očekuje da rade kao prije pandemije, ali će to morati učiniti drugačije putem virtualnog i daljinskog upravljanja. Ako organizacija ima plan kontinuiteta poslovanja, morat će se uvjeriti da pokriva sve potrebe poslovanja. To uključuje razumijevanje kako donositi odluke s neizvjesnošću te koji je najbolji pristup za održavanje usmjerenosti na izvršenje, suradnju i komunikaciju na daljinu i nastavak poslovanja.

Da bi to učinile, organizacije trebaju osigurati da poslovna strategija uključuje upravljanje kriznim situacijama, oporavak od katastrofe i upravljanje rizicima kako bi se prilagodile i vratile u normalu. U ovoj prilagodbi potrebno je voditi računa o slijedećem aspektima (Slika 1):

¹⁰ Ibid.

¹¹ Ibid.

Slika 1. Aspekti prilagodbe poslovanju u kriznim situacijama



Izvor: Izradio autor.

- *Kontekst* – strateški poslovni ciljevi koji su jučer bili važni sada su važniji. Taktike će trebati ažurirati, ali ostati usredotočen na kontekst ključno je za poslovni učinak.
- *Produktivnost* – može uključivati izgradnju novih virtualnih alata za praćenje odvijanja projekta ili rada tima, korištenje različitih alata za suradnju i podršku komunikaciji na daljinu.
- *Komunikacija* – stvaranje strukturiranog komunikacijskog formata i postavljanje ciljeva u kontekstu rada na daljinu, što treba pomoći zaposlenima da ostanu usredotočeni i produktivni tijekom vremena neizvjesnosti. Pritom je potrebno osigurati načine na koje zaposleni mogu dati povratne informacije i komunicirati probleme ili nedoumice.
- *Stalno poboljšavanje* – edukacija i razvoj vještina upravljanja virtualnim timom i suradnjom, što bi trebalo pomoći zaposlenima da se prilagode, usvoje nove načine rada i budu produktivni.
- *Održivost* – planovi za osiguravanje kontinuiteta poslovanja trebaju osigurati da je poslovanje dugoročno održivo i sposobno odvijati se sukladno promjenama okolnosti konteksta, u bilo kojoj vrsti krize.

Pandemija korona virusa COVID-19 uzrokovala je i ozbiljne poremećaje u odvijanju globalnih lanaca opskrbe, što je izazvalo niz problema u poslovanju i narušilo ravnotežu između globalne ponude i potražnje. Ublažava-

nje tih poremećaja i uspostavljanje što normalnijeg odvijanja lanaca opskrbe postali su prioritet brojnih sudionika globalnog tržišta u što su se uključile i vlade brojnih zemalja, ali i nadnacionalne ekonomske i političke integracije. Cilj je bio, u datim okolnostima, uvažavajući promjene konteksta, uspostaviti što normalnije odvijanje lanaca opskrbe je o tome ovisi kvaliteta života svih na planeti. Na globalnoj razini poduzete su brojne mjere u cilju prilagodbe i omogućavanja normalizacije odvijanja lanaca opskrbe.¹²

Rješavanje ovog problema zahtijeva promjenu određenih strategija. Tako su, u cilju smanjenja rizika od poremećaja u lancima opskrbe sirovinama, poluproizvodima i gotovim proizvodima, brojne organizacije sudionici globalnog tržišta, države i nadnacionalne organizacije poput Europske unije (EU), promijenile svoje dotadašnje strategije, kao npr.:

- *Skraćivanje lanaca opskrbe* – brojni lanci opskrbe započinju na Dalekom Istoku gdje se proizvode komponente za proizvodnju gotovih proizvoda širom svijeta (npr. čipovi) zbog čega osobito trpi automobilska industrija. Skraćivanjem lanca opskrbe čipovima na način da se proizvode u Europi, EU želi staviti ovaj lanac opskrbe pod svoju kontrolu. U tom smislu planira investicije u proizvodnju čipova na tlu Europe i na taj način upravljati rizicima za neke buduće krize kojih će sigurno biti.
- *Insourcing* – je strategija vraćanja industrija koje su velike europske i američke kompanije u 1970-tim i 80-tim godinama 20. st. preselile u druge dijelove svijeta, prvenstveno Daleki Istok, zbog jeftine radne snage i dostupnosti sirovina (outsourcing). Na taj se način osigurava veća kontrola nad vlastitom proizvodnjom, smanjuje se rizik poremećaja logističkih procesa, doprinosi rješavanju pitanja nezaposlenosti u vlastitoj zemlji i doprinosi suzbijanju inflacije.
- *Alternativni pravci odvijanja lanaca opskrbe* – pojedine zemlje poput Kine, većinu svog izvoza proizvoda obavljaju morskim putem. Uslijed poremećaja u lancima opskrbe (kineske pomorske luke, blokada Sueskog kanala, nedostatni brodski kapaciteti, rast vozarina i dr.) proizvođači u Kini počeli su razmišljati o alternativnom, kopnenom pravcu za lance opskrbe kojima snabdijevaju Europu svojim proizvodima.
- *Više dobavljača* – za vitalne sirovine, poluproizvode i proizvode traže se alternativni dobavljači kako bi se smanjila ovisnost od jednom dominantnom dobavljaču, a što bi trebamo omogućiti nastavak po-

¹² Miroslav Drljača, Patricia Repnjak, „Supply chains in the context of the COVID-19“, Proceedings of the International Scientific Conference *The Science and Development of Transport (ZIRP 2020)*, *Transformation of Transportation*, University of Zagreb, Faculty of Transport and Traffic Sciences, Šibenik, Zagreb, (online), 2020, pp 35-46.

slovanja i u okolnostima poremećaja u odvijanju lanaca opskrbe. To omogućuje i osiguravanje zamjenskih proizvoda u slučaju poremećaja i nedostupnosti pojedinih proizvoda na tržištu.

Promjena strategija je složena poslovna odluka i zahtijeva značajne resurse. Poduzima se u cilju anticipativnog upravljanja nekim budućim krizama uslijed kojih će doći do poremećaja u odvijanju lanaca opskrbe. Poduzima se u cilju osiguravanja postojeće razine kvalitete poslovanja i kvalitete života građana, odnosno njezinog poboljšavanja.

Pandemija korona virusa COVID-19 uzrokovala je brojne promjene na privatnom i profesionalnom planu ljudi širom svijeta. Pored negativnih posljedica, dogodile su se i neke pozitivne promjene i procesi od kojih će se dio nastaviti i nakon pandemije. U tablici 1. prikazane su negativne i pozitivne promjene od utjecaja na kvalitetu života ljudi.

Tablica 1. Negativne i pozitivne posljedice pandemije na kvalitetu života ljudi

	Negativne	Pozitivne
Privatni život	<ul style="list-style-type: none"> - ograničeno kretanje - smanjen socijalni kontakt - smanjena razonoda i zabava - brza hrana (dostava) - slabija fizička aktivnost - zdravstveni problemi - odgođeni zdravstveni pregledi - otuđenost - neizvjesnost - otežano snabdijevanje domaćinstva - stres 	<ul style="list-style-type: none"> - nove vrste usluga - telezdravstvo - online rješavanje životnih situacija - online obrazovanje - jačanje obiteljskih veza - smanjenje zagađenja zraka - osjećaj otpornosti - razvoj znanosti - primjena znanstvenih otkrića - nova organizacija života za krizne situacije
Profesionalni život	<ul style="list-style-type: none"> - ograničen rad u radnoj sredini - izbjegavanje fizičkih sastanaka - ograničena putovanja - ograničeno kretanje u javnom prostoru - ograničen živi timski rad - problemi u proizvodnji - poremećeni lanci opskrbe - nedostatak prihoda - problemi upravljanja - neizvjesnost - stres 	<ul style="list-style-type: none"> - rad od kuće i na daljinu - online sastanci - nova znanja - primjena novih tehnologija - razvoj bez-kontaktnih tehnologija - razvoj novih proizvoda - razvoj novih usluga - novi način upravljanja - prilagodba kontekstu - prilagodba institucionalnog okvira - prilagodba strategija, politika i ciljeva

Izvor: Izradio autor.

U relativno kratkom vremenu od dvije godine, svijet se prilagodio kontekstu i izvršio prilagodbu u brojnim područjima života i rada kako bi nastavio što normalnije živjeti i raditi u novim okolnostima. Negativne posl-

jedice sigurno su ostavile trag kako na pojedincima tako i na institucijama. Ovo je teško stečeno iskustvo koje treba koristiti u budućim krizama kako bi njihov negativan utjecaj na kvalitetu života bio što manji.

4. PROMJENE KONCEPATA KVALITETE

Promjena strategija, upravljanje rizicima i prilagodbe okolnostima konteksta uzrokovale su i promjene u primjene određenih koncepata upravljanja kvalitetom, kao što su JIT (Just in Time) i usmjerenost na kupca u smislu ispunjavanja njegovih stvarnih i pretpostavljenih zahtjeva.

Sustav zaliha točno na vrijeme (JIT) je strategija upravljanja koja usklađuje narudžbe sirovina i poluproizvoda od dobavljača izravno s dinamikom proizvodnje. Tvrtke koriste ovu strategiju zaliha kako bi povećale učinkovitost i smanjile otpad primajući sirovine i poluproizvode samo kad im je to potrebno za proizvodni proces, što smanjuje troškove zaliha. Ova metoda zahtijeva od proizvođača točnu procjenu potražnje.

JIT je strategija upravljanja koja povećava učinkovitost. Pravovremena proizvodnja također je poznata kao Toyotin proizvodni sustav jer je proizvođač automobila Toyota usvojio i počeo primjenjivati ovaj sustav 1970-ih godina 20. st. Uspjeh JIT proizvodnog koncepta temelji se na postojanoj proizvodnji, visokokvalitetnoj izradi, bez kvarova na strojevima i pouzdanim dobavljačima. Pojmovi „proizvodnja kratkog ciklusa“ (short-cycle manufacturing), koju koristi Motorola, i „kontinuirana proizvodnja“ (continuous-flow manufacturing), koju koristi IBM, sinonimi su za JIT koncept.

Usljed poremećaja u lancima opskrbe izazvanim pandemijom korona virusa COVID-19, došlo je i do prilagodbe JIT koncepta. Osnovna načela ovog koncepta i dalje su na snazi, uz prilagodbu da se proizvođači osiguravaju određenim sigurnosnim zalihama kritičnih sirovina i poluproizvoda koje drže u skladištima, kako bi osigurali kontinuitet proizvodnje. Naime, proizvođači imaju ugovore s kupcima širom svijeta i prekoračenje rokova isporuke uzrokovalo bi značajne troškove zbog (ne)kvalitete te gubitak povjerenja kupaca i imidža. Ovu prilagodbu JIT koncepta u smislu osiguravanja zaliha kritičnih komponenti izvršila je i Toyota.¹³

¹³ Autor ovog članka boravio je u Japanu u rujnu i listopadu 2022. godine, kojom prilikom je posjetio Toyotu, obišao proizvodne pogone i proizvodne procese automobila u Toyotinom pogonu u Nagoyi, razgovarao s Potpredsjednikom Toyote i menadžerima kvalitete u Toyotinom centru za izučavanje kvalitete, kojom prilikom je potvrđeno da je Toyota izvršila prilagodbu JIT koncepta u dijelu koji se odnosi na osiguravanje sigurnosnih zaliha za kritične komponente, a kako se ne bi ugrozio kontinuitet proizvodnje u njihovih 57 tvornica širom svijeta te isporuka.

Usljed poremećaja globalnih lanaca opskrbe, prilagodbu je doživio i koncept „usmjerenosti na kupca u smislu ispunjavanja njegovih stvarnih i pretpostavljenih zahtjeva.“ Prilagodbu čini kupac uslijed nestašica pojedinih proizvoda na tržištu. Dobar primjer je automobilska industrija koja je do prije pojave pandemije bila usmjerena na kupca do razine da su automobili bili individualizirani sukladno zahtjevu kupca do najsitnijeg detalja. Poremećaj u globalnim lancima opskrbe uzrokovao je zastoje u proizvodnji automobila. Kupac koji želi novi automobil u većini slučajeva mora biti spreman na rokove isporuke od nekoliko mjeseci, a za pojedine marke i tipove vozila i do godinu dana. Međutim, ukoliko kupac korigira svoj zahtjev za karakteristikama ponude automobila pojedinih dilera na tržištu, može odmah preuzeti automobil. To ne znači da se odustalo od koncepta „usmjerenosti na kupca u smislu ispunjavanja njegovih stvarnih i pretpostavljenih zahtjeva“, ali je, uslijed promjene okolnosti konteksta, nužno da kupac ne inzistira na svojim zahtjevima već da svoj zahtjev prilagodi kontekstu. Pritom nisu narušena načela upravljanja kvalitetom, već je izvršena nužna prilagodba uslijed promjene okolnosti konteksta.

5. PRILAGODBA NAČELA UPRAVLJANJA KVALITETOM

Usljed promjene konteksta uzrokovane pandemijom korona virusa COVID-19, nužno je došlo do prilagodbe načela upravljanja kvalitetom kako ih definira međunarodna norma ISO 9000:2015.¹⁴ Te su prilagodbe nužne u dijelu koji omogućuje razumijevanje konteksta i djelovanje u promijenjenim okolnostima konteksta, na način da se ne naruši temeljna poruka bilo kojeg načela. Načela upravljanja kvalitetom definirana u normi ISO 9000:2015 predstavljaju okvir za djelovanje koji omogućuje svakoj organizaciji prilagodbu sukladno njenim potrebama i posebnostima.

¹⁴ HRN EN ISO 9000:2015 Sustavi upravljanja kvalitetom – Temeljna načela i terminološki rječnik (ISO 9000:2015; EN ISO 9000:2015).

Tablica 2. Prilagodba načela upravljanja kvalitetom kontekstu pandemije COVID-19

Rb.	Načelo upravljanja kvalitetom	Norma ISO 9000:2015	Prilagodba kontekstu pandemije COVID-19
1.	Usmjerenost na kupca	Glavno je težište upravljanja kvalitetom ispunjavanje zahtjeva kupaca i nastojanje da se nadmaše njihova očekivanja. Trajni uspjeh ostvaruje se kada organizacija privlači i zadržava povjerenje kupaca i ostalih bitnih, zainteresiranih strana. Svaki aspekt interakcije s kupcima prilika je za stvaranje veće vrijednosti za kupca. Razumijevanje sadašnjih i budućih potreba kupaca i ostalih zainteresiranih strana pridonosi trajnom uspjehu organizacije.	I dalje je potrebno razumijevanje sadašnjih i budućih potreba kupaca i ostalih zainteresiranih strana, uz potrebu da se u interakciji s kupcem kupca informira o mogućnostima ispunjavanja njegovih zahtjeva ukoliko ih prilagodi kontekstu. Prilagođeni zahtjevi korisnika trebaju biti ispunjeni uz nastojanje da se i nadmaše. (Primjer: kupnja automobila)
2.	Vodstvo	Rukovoditelji na svim razinama utvrđuju jedinstvenu svrhu i usmjerenje te stvaraju uvjete u kojima se ljudi uključuju u ostvarivanje ciljeva kvalitete u organizaciji. Stvaranje jedinstvene svrhe i usmjerenja te uključenost ljudi omogućuju organizaciji da uskladi svoje strategije, politiku, procese i resurse radi ostvarivanja svojih ciljeva.	Organizacija prilagodava strategije, politike, procese i resurse kako bi omogućila uvjete u kojima se ljudi uključuju u ostvarivanje ciljeva kvalitete u organizaciji. (Primjer: osiguravanje uvjeta za rad od kuće i na daljinu, edukacija za korištenje novih komunikacijskih tehnologija).
3.	Uključenost ljudi	Osposobljeni, osnaženi i uključeni ljudi na svim razinama cijele organizacije neophodni su za povećanje sposobnosti organizacije da stvara i donosi vrijednost. Kako bi se djelotvorno i učinkovito upravljalo organizacijom, važno je poštovati i uključiti sve ljude na svim razinama. Priznavanjem ljudi i obogaćivanjem njihovih sposobnosti potiče se njihova uključenost u ostvarivanje ciljeva kvalitete u organizaciji.	Organizacija stvara mogućnosti za uključivanje svih ljudi i obogaćivanje njihovih sposobnosti radi ostvarivanja ciljeva organizacije. (Primjer: osiguravanje uvjeta za rad od kuće i na daljinu, edukacija za korištenje novih komunikacijskih tehnologija).

4.	Procesni pristup	Dosljedni i predvidljivi rezultati postižu se djelotvornije i učinkovitije kada se aktivnosti razumiju i kada se njima upravlja kao međusobno povezanim procesima koji funkcioniraju kao skladan sustav. Sustav upravljanja kvalitetom se sastoji od međusobno povezanih procesa. Razumijevanjem načina na koji taj sustav ostvaruje rezultate, organizacija može poboljšati sustav i njegovu učinkovitost.	Organizacija treba inovirati svoje poslovne procese kako bi ih prilagodila promijenjenom kontekstu, za što treba osigurati sredstva, procedure i osobiti ljude. (Primjer: implementacija bez-kontaktne tehnologije u procesu prihvata i otpreme putnika i prtljage na zračnim lukama ili bez-kontaktna tehnologija kod korištenja bankarskih usluga).
5.	Poboljšavanje	Uspješne organizacije trajno su usredotočene na poboljšavanje sustava. Poboljšavanje je nužno da bi organizacija mogla održavati trenutačnu razinu uspješnosti, odgovarati na promjene u svojim unutarnjim i vanjskim okolnostima i stvarati nove prilike.	Organizacija treba odgovoriti na promjene vanjskog i unutarnjeg konteksta, organizacijski, tehnološki, kulturološki i dr., a kako bi nastavila održavati trenutačnu razinu uspješnosti i poboljšavati je.
6.	Donošenje odluka na temelju činjenica	Odluke koje se temelje na analizi i vrednovanju podataka i informacija vrlo vjerojatno dovode do željenih rezultata. Donošenje odluka može biti složen proces i uvijek uključuje određenu nesigurnost. Često uključuje više vrsta i izvora ulaznih podataka, kao i njihovo tumačenje, koje može biti subjektivno. Važno je razumjeti uzročno-posljedične veze i moguće nepredviđene posljedice odlučivanja. Analiza činjenica, dokaza i podataka dovodi do veće objektivnosti i pouzdanosti u odlučivanju.	Organizacija treba analizirati i razumjeti promjene vanjskog i unutarnjeg konteksta, objasniti ih kvalitativno i kvantitativno te na temelju takve analitičke podloge donositi poslovne odluke.
7.	Upravljanje odnosima	U cilju trajnog uspjeha, organizacije upravljaju svojim odnosima sa zainteresiranim stranama, kao što su dobavljači. Bitne zainteresirane strane utječu na uspješnost organizacije. Trajni je uspjeh vjerojatniji kada organizacija upravlja odnosima sa svim svojim zainteresiranim stranama kako bi optimizirala njihov učinak na vlastitu uspješnost. Upravljanje odnosima s mrežom dobavljača i partnera osobito je važno.	Upravljanje odnosima, osobito s dobavljačima, važno je kako bi se osigurali inputi za vlastite proizvodne procese. Organizacija treba smanjiti ovisnost o jednom dobavljaču i osigurati alternativu za ključne sirovine i komponente. Isto se primjenjuje i na usluge.

Izvor: Izradio autor prema: HRN EN ISO 9000:2015 Sustavi upravljanja kvalitetom – Temeljna načela i terminološki rječnik (ISO 9000:2015; EN ISO 9000:2015).

Načela upravljanja kvalitetom dovoljno su širok okvir koji omogućuje prilagodbu promjenama konteksta. U tom okviru mogu se pronaći sve organizacije bez obzira na djelatnost, fizičku veličinu i financijsku snagu. To je osobito važno za bilo koju ozbiljniju promjenu vanjskog konteksta. Primjer iz tablice 2. odnosi se na pandemiju. Međutim, sigurno je da će se promjene vanjskog konteksta, uslijed različitih okolnosti (politika, geopolitika, prirodne katastrofe, terorizam, pandemija i dr.) događati i u budućnosti. U tablici 2. prikazani primjer, uz odgovarajuću prilagodbu ovisno o okolnostima koje utječu na promjenu konteksta, moguće je primijeniti i u budućim krizama.

6. ZAKLJUČAK

Kvaliteta kao fenomen je konstanta. Unatoč brojnim okolnostima koje negativno djeluju na kvalitetu kao konstantu, kvaliteta uspijeva zadržati pozitivan trend razvoja, promatrano na dugi rok. Kvaliteta nije stanje već proces. Kvaliteta je put koji nema kraj. Put je cilj.

Pandemija korona virusa COVID-19 predstavlja novo iskustvo za suvremena društva. Znači promjenu konteksta rada i života. Uspjela je razbiti brojne stereotipe i predrasude. Prisilila je čovječanstvo na brzu zajedničku reakciju unatoč brojnim razlikama među narodima, državama, savezima i političkim pogledima. Uspjela je ujediniti čovječanstvo oko zajedničkog interesa, kako pronaći lijek, sačuvati ljudske živote i nastaviti ekonomsku i društvenu aktivnost na svim razinama, sačuvati kulturu, običaje, način života, rutinu. Čovječanstvo je pronašlo rješenje kako se ne predati već kako živjeti s pandemijom korona virusa COVID-19. Kvaliteta kao poslovanja filozofija, pragmatički pristup i način življenja pomogla je u rješavanju ovog globalnog problema koji je prijetio eskalacijom, ekonomskom, a onda nužno i fizičkom uništenju civilizacije. Kvaliteta je pomogla riješiti problem na svim razinama, od zbrinjavanja oboljelih, pronalaska cjepiva, do pronalaženja novih procedura i modela upravljanja. To je bilo moguće iz razloga što su načela upravljanja kvalitetom kako ih je definirala norma ISO 9000:2015 koncipirana kao okvir unutar kojeg postoji dovoljan prostor za djelovanje svakog pojedinog subjekta, sudionika globalnog tržišta, na način da radi na prilagodbi novom kontekstu i na poboljšanjima, uzimajući u obzir svoje interese i posebnosti.

Percepcija kvalitete u kontekstu pandemije korona virusa COVID-19 upućuje na zaključak da primjena načela upravljanja kvalitetom, uz odgovarajuću prilagodbu, može doprinijeti rješavanju globalnih problema u složenom kontekstu. A svijet je pokazao da se može ujediniti kad pronađe zajednički interes i da je u takvim okolnostima sposoban, unatoč svim razlikama, taj inte-

res i ostvariti. To je praktična primjena kvalitete kao globalne strategije. To je konkretan doprinos povećanju razine kvalitete života svih na planeti i mogući model za rješavanje globalnih neravnoteža.

Abstract:

PERCEPTION OF QUALITY
IN THE CONTEXT OF THE COVID-19 PANDEMIC

The corona virus pandemic (COVID-19) that appeared in 2019/2020 is a new respiratory disease. More than one pandemic in recent history has affected the global economy. In addition to the fight for people's health, all countries took measures to mitigate the negative economic consequences. Within this framework, numerous measures have been taken to reduce disruptions to the flow of goods and supply chains, as well as to the provision of services. The pandemic, as a global phenomenon, necessarily has an impact on all aspects of people's lives on the planet. The pandemic has changed the interests and demands of citizens around the world, their priorities as well as their perception of quality. It also influenced the need for a flexible interpretation of certain quality concepts, such as Just in Time (JiT), meeting user requirements, etc. The interpretation of quality management principles also requires a flexible approach. In this paper, the author, applying scientific methods of cognition, researches the pandemic of the corona virus COVID-19 as a circumstance that changed the global context and its impact on the perception of the phenomenon of quality, which is understood as a business philosophy, a pragmatic approach and a way of life.

Key words: quality, perception of quality, COVID-19 pandemic.

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QUALITY ENLIGHTENMENT AND A NEW TYPOLOGY OF QUALITY DIMENSIONS

KVALITETNO PROSVJEĆENJE
I NOVA TIPOLOGIJA DIMENZIJA KVALITETE

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ABSTRACT

The purpose of this conceptual paper is to develop, in the context of an evolving process of Quality Enlightenment, a new typology of Quality Dimensions with universal application in the design and development of diverse kinds of products and services, including those emanating from the new Digital World, while also addressing sustainability concerns as integral to quality. Dimensions of quality were proposed by David A. Garvin, A. Parasuraman and others. The approach taken in this paper is to consolidate these dimensions, in the light of historical evolution, with additional dimensions based on considerations related to environmental sustainability, digital transformation, and the influence of other advancing technologies. The additional dimensions represent an enlarged role for quality professionals, and indeed for all

professionals working on products and services., a confluence essential to Quality Enlightenment. A conceptual typology of generic dimensions that can be used as a checklist to fool-proof the search for specific needs of customers and society has been developed as a framework for quality professionals, designers, manufacturers and service providers in a more enlightened future.

Key words: Quality enlightenment, Typology of Quality dimensions, Service Quality, Sustainability, Digitalization, Attractive Quality,

1. A DEFINING MOMENT AND A RENAISSANCE

Defining Moment: The last defining moment in the development of quality thinking occurred with the 1980 NBC documentary *If Japan can, Why Can't We?* featuring W. Edwards Deming. It signalled a renaissance which sparked the attention of American CEOs who had been for some time seeking answers to the mysteries of the Japanese dominance of their markets through their quality approach. The Japanese idea of Quality Control Circles (abbreviated in America to Quality Circles) had not seemed to be an adequate answer and it headed towards abandonment in the West. However, the Western approach to management needed to change. Now, not only Deming, but also Joseph M. Juran and Armand V. Feigenbaum resurfaced from years of obscurity. "Export anything to a friendly country except American management,"¹ Deming declared in his acerbic style. Deming's theories expressed as Fourteen Points, Seven Deadly Diseases, and numerous Obstacles; his passionate arguments against performance appraisals; and the four components of his System of Profound Knowledge made a deep impression across the world. Throughout this period, these men wrote best-selling books which promoted quality globally. A sense of excitement arose, which even penetrated the hallowed halls of government.

The 1980s Renaissance: Noriaki Kano² introduced the concept of attractive quality. The QC Story as a problem-solving methodology was published in English. Florida Power & Light won the first ever overseas Deming Prize from the Japanese Union of Scientists and Engineers (JUSE). Japanese Total Quality Control (TQC) became transformed into a Western manifestation as Total Quality Management (TQM). ISO 9000:1987 was adopted as a global

¹ Mary Walton, *The Deming Management Method*, Tarcher-Perigee, New York, NY, 1988.

² Noriaki Kano, Nobuhiko Seraku, Fumio Takahashi, Shinichi Tsjui, "Attractive quality and must-be quality, Hinshitsu", Vol. 14, No. 2, 1984, pp 147-156.

standard for Quality Management System. The Toyota Production System spread to the West, with its concentration on Just-in-Time (JIT) production.

The Malcolm Baldrige National Quality Award criteria engaged senior executives in business performance improvement activities and this concept was reinforced by the European Foundation for Quality Management's award. The *Profit Impact of Market Strategy* (PIMS) study³ at the Wharton Graduate School of Business established the relationship between market dynamics, customer satisfaction, and profitability of new product investments. Motorola challenged its suppliers to pursue 'flawless execution' by applying its Six Sigma methods, which evolved out of the Japanese PDCA model and was recast as DMAIC. Indeed, 1987 may be termed a pivotal year for broadening the understanding of a modern concept of managing for quality.

The 1990s: This resurgence continued through the end of the 20th Century and ushered the modern age of quality thinking. Six Sigma emerged as the largest wave of change in the west. In parallel, a five-year MIT study⁴ of automotive industry production practices described the Toyota Production System as a *Triumph of the Lean Production System*. The resultant reinterpretation of Japanese methods has become recognized as a global Lean Movement which, integrated with Six Sigma, evolved as Lean Six Sigma (LSS).

Approximately 80% of the Fortune-500 companies have deployed LSS. Its DMAIC improvement procedure, bolstered by certification systems and supported by statistical software, has become standard practice around the world. With computers becoming ubiquitous, statistical methods are being applied more readily and widely in all operational and management aspects of business, using specialized software. This could be termed the democratization of statistics by making it more universally accessible to engineers and business workers. In parallel, there was a much greater use of quality techniques in services. Japan adopted the term TQM in 1997, and Kano popularized the Task Achieving QC Story method for creating either new systems or for breaking through the frameworks to redesign existing systems, a parallel to the less well-structured analytic methodologies of the Design-for-Six-Sigma (DFSS) approach applied in the West. Toyota refined its practice of worker involvement and quality assurance through its promotion of the *Ji Kotei Kanketsu*⁵ method for 'built-in quality with ownership.'

³ Robert D. Buzzell, Bradley T. Gale, *The PIMS Principles (Profit Impact of Market Strategy): Linking Strategy to Performance*, The Free Press, New York, NY, 1987.

⁴ John F. Krafcik, "Triumph of the Lean Production System", *Sloan Management Review*, 301, 1988, pp 41-52.

⁵ Shinichi Sasaki, *JKK that Toyota Proceeds*, JKK Training Program, Gurgaon, 2017.

2. A CHANGED WORLD

During this time, the established Gurus of Quality slowly gave way to a more democratized Quality movement. But, as will be seen, all this has not been sufficient to deliver the visionary concept of Kaoru Ishikawa⁶ (1990) who propagated Quality “in the hope of happiness of all people in the world.”

Table 1 illustrates the significant shifts that have occurred in the last forty years in respect of environmental concerns and the rush of digitalization, though biochemical and materials technologies could well be added. as the world has changed at a quickening pace, posing new and bewildering challenges. Planetary concerns, of which global warming is but one, dominate the mind space, as they brook no delay in rectification. A pandemic, which experts had perpetually feared was around the corner, has been devastating. Extensive technological developments and digitalization promise an exciting future and are reshaping the landscape of manufacturing, services, communication, transport, and biotechnologies.

Table 1. Environment and Technology in 1980s compared to the world in 2020

Category	The world in 1980s	The world in 2020
Environmental	<ul style="list-style-type: none"> • Deforestation, acid rain, toxic substances, pesticides, hazardous wastes • Oil prices push energy development 	<ul style="list-style-type: none"> • Environmental sustainability as a global concern: CO₂ in atmosphere >400 ppm against ~310 in 1950. Stratospheric ozone accumulation, ocean de-alkalization • 9 billion tons of plastics clog land and oceans • Biodiversity loss, depleted marine fisheries • Large-scale chemicalization including endocrine-disrupting chemicals in food and water. Also, pesticides, heavy metals, oils • Loss of tropical forests, topsoil • Rise of renewable energy
Digitalization	<ul style="list-style-type: none"> • 1981: The PC introduced by IBM • Walkman, Compact discs • Video games take off • Some Internet in Academia 	<ul style="list-style-type: none"> • Internet, smart phones, connected world, dematerialized books, music, photos, movies... • AI, machine learning, Big Data, IoT. 3-D printing, drones, robotics • Online retailing, banking, journalism, education, health care, counselling, conferences, work-from-home... • Extreme electronics in cars, fridges, washing machines

⁶ Kaoru Ishikawa, *Introduction to Quality Control*, English ed., 3A Corporation, Tokyo, Japanese Hinshitsu Kanri Nyumon, 3rd ed. JUSE Press, Tokyo, 1990.

For quality protagonists, this means that the world is now dealing with a slew of challenges for which there are no precedents. Though the fundamentals of quality remain relevant, the audiences and their needs are new and different. It is imperative that Quality thinking become adaptive to understand the needs of the aged on the one hand, and those of the Millennials and even the so-called Zoomers on the other hand. Not always cognizant of the magnitude of these changes, the quality profession has tended to stagnate, and has lacked the kind of fresh impetus it requires to remain relevant.

3. THE NEW WORLD AND THE NEED FOR QUALITY ENLIGHTENMENT

Understanding the New World: From an environmental perspective, this current epoch has been labelled Anthropocene⁷ to reflect the large scale of human intervention. We are witness to several alarming developments – the decline in both population and diversity of species, the dangerous increase in mean temperature of the earth, severe pollution affecting land, air and water bodies, depletion of marine life, forests, topsoil, fossil fuels and minerals, and the rise of lifestyle diseases punctuated by new and hazardous infectious diseases. Parallel to some halting responses at the global level, some bold new concepts have been put out to reverse environmental damage. Examples include the Circular Economy, Blue Economy⁸, Performance Economy⁹, Natural Capitalism¹⁰ Cradle-to-Cradle¹¹ and Regenerative Designs¹², and Biomimicry¹³. The Quality profession needs to penetrate these approaches deeply.

Technologically, we observe emergence of an era of digitalization, a transformation referred to as Industry 4.0. Statistics and data science together with enabling technologies like the Cloud now envelop a Big Data infrastructure, Blockchain and Artificial Intelligence, leading to Machine Learning,

⁷ Paul J. Crutzen, *The “Anthropocene”*. In: Ehlers E., Krafft T. (eds) *Earth System Science in the Anthropocene*. Springer, Berlin, Heidelberg, 2006, pp 5-12.

⁸ Gunter Pauli, *The Blue Economy: version 2.0*, Academic Foundations, 2015.

⁹ Walter Stahel, *The Performance Economy*, (2nd ed.), Palgrave Macmillan, Hampshire, 2010.

¹⁰ Paul Hawken, Amory B. Lovins, Hunter L. Lovins, *Natural Capitalism: the Next Industrial Revolution*, 2nd ed. (London: Routledge), 2010.

¹¹ Michael Braungart, William McDonough, *Cradle to Cradle*, Vintage. London (Kindle Ed.), 2008.

¹² John Lyle, *Regenerative Design for Sustainable Development*, (Revd. Ed.) John Wiley & Sons, New York, 1996.

¹³ Janine M. Benyus, *Biomimicry: Innovation Inspired by Nature*, William Morrow, New York, 2002.

Neural Networks and Deep Learning.¹⁴ Simultaneously, other revolutions are in their formative maturing processes. Examples of such advances occur in biosciences, nanotechnologies, medical sciences, transportation (including the futuristic Hyperloop), sustainable buildings, clean energy generation, distribution technologies, and so on. These promise a rousing future for humanity, positioned on universally accessible knowledge and information, increased lifespans, and hopefully, the removal of hunger and poverty. An enlightened Quality discipline should be an integral part of these transformations.

Established Quality Practices: Customary methods of quality have the capability to support many of the requirements of this emerging world. Quality management rests on sound concepts and principles. Fundamentally, it helps build a strong organizational orientation towards serving customers (or patients, students, citizens as appropriate for the organizational model). It has evidence-based systems for formulating vision supported by metrics and targets, for design and development of products, processes, and equipment, and for incorporating Lean methods for eradication of wastes and undesirables. It stimulates enthusiastic participation from everyone, thus producing momentum. Its mechanisms – like cross-functional management, policy management, daily management, and management diagnosis – enable constant improvements as well as retention of the benefits achieved. Thus there is no reason why Quality cannot be woven without hesitation or lag into the developments of a new world

Quality a Step Behind: There is a difference between the characteristics of the transformation that occurred in the post-war period of quality and the conditions that currently prevail. In 1950 a post-war Japan thirsted for knowledge that could build a strong, competitive industry. In 1980, America was in search of the ‘secret’ behind Japan’s economic success. In both situations, Quality had the answers. But now, quite plainly, Quality Management has not kept pace with the tidal wave of global developments and challenges. Quality professionals find themselves confined to legacy businesses, excluded from these new application areas that require different kinds of subject matter expertise. This new set of challenges diverges so far from the past that it may be necessary to re-establish the relevance of Quality in ways that catch the attention of CEOs and decision-makers on the one hand and engage the communities of younger generations who will have to take the responsibility for carrying forward the enlightened developments of quality in the coming decades, on the other.

¹⁴ Nicole M. Radzivil, *Connected, Intelligent, Automated*, ASQ Quality Press, Milwaukee, 2020.

For example, Toyota's concept of *autonomation* – automation with a human face – should apply even more profoundly to designing autonomous vehicles that change both social systems and technology. Big Data has become the domain of Data Scientists, whose work applies algorithms, but they do require the orthodox methods of statisticians, such as modelling.¹⁵ The current situation requires that Quality Management and the new technologies work together.

Quality Enlightenment: Though the environmental community calls this an Anthropocene age, there is no agreed term or operational definition that characterizes and classifies the combined environmental, technological, and human developments of today. We must come to agreement on the challenges and develop a unified approach that advances our profession in the face of these current opportunities.

The Quality profession needs to undertake self-development vigorously in this new era. We must declare our common approach that has the power to create a new reality for quality thinking and application. The Enlightenment of the 18th century stood for reason, liberty, tolerance, and fraternity, signifying a new level of humanism. Perhaps we should declare a period of *Quality Enlightenment* that embraces all the new sciences and technologies, for the benefit of not just Generation X, but for the Millennials, the Zoomers, the Alpha generation and all other future generations yet to be labelled. This should be the theme of a new declaration or manifesto or declaration of strategic intent as a professional community. A first step in this direction would be to expand the dimensions of quality to fit the shifting demands of this changing world in a way such that quality becomes not just relevant but an indispensable stimulus to address the breadth of changes to come.

4. BUILDING UP THE DIMENSIONS OF QUALITY

An early delineation of Quality dimensions arose from a service perspective in the Marketing discipline when Parasuraman et al.¹⁶ developed a conceptual model for service quality. Shigeru Mizuno,¹⁷ in the English trans-

¹⁵ Roger W. Hoerl, "Discussion of Analysing Behavioral Big Data: Methodological, practical, ethical and moral issues," *Quality Engineering*, Vol. 29, No. 1, 2017, 75-78.

¹⁶ A. Parasuraman, Valarie A. Zeithaml, Leonard L. Berry, "A conceptual model of service quality and its implications for future research", *Journal of Marketing*, Vol. 49, No. 4, 1985, pp 41-50.

¹⁷ Shigeru Mizuno, *Company – wide total quality control*. Tokyo, Asian Productivity Organization. Tr. From the Japanese Zensha sogo hinshitsu kanri (1984), 1988.

lation from Japanese of his 1984 book on quality control, developed eleven elements of quality, seven of which, such as durability, safety or ease of use he regarded as ‘negative’ quality factors and four, such as good design or physical appeal as ‘positive’. ‘Negative’ elements meant that their ‘absence can doom a product, but their presence alone does not ensure that a product will survive competition,’ a concept that came to be called ‘must-be’ quality. Harvard’s David Garvin¹⁸ published a model comprising eight dimensions of quality – such as performance, reliability, aesthetics and even perceived quality. Deming followers Ronald Moen et al¹⁹ expanded the Garvin list to eleven elements, and including harmlessness, which they defined as characteristics related to safety, health or environment.

The Garvin model continues to dominate deliberations on Quality Dimensions. There exists a need a more universal and complete set of dimensions must be established, to synchronize with the emerging expectations of this changing world.²⁰

Basic Dimensions: Consider the elements of quality that characterize a tangible product, building on Garvin’s eight critical dimensions. We leave out *conformance* as it could apply to all dimensions. We then have *performance, features, reliability, durability and perceived quality* (which is a part of the purchasing decision). We rename Garvin’s *aesthetics* in two parts as *emotional* and *sensory attributes*. There are three elements relating to *economy-in-use* (in lifecycle), *ease-of-use* and *safety-in-use* which are widely accepted dimensions and may be too important in each case to be subsumed under the performance dimension. Garvin’s *serviceability* can be made a part of *ease-of-use* and is also a part of a new dimension *technical assistance* for ease of installation, maintenance and use, which is a broader dimension than *serviceability*. Support in *product selection* should be a quality dimension especially when wide choices are offered, as mis-selection can negate all qualities. At a business level, the quality of *relationship* with the customer and influencers is necessary for customer retention, as is the *ease of doing business* with the company, which applies to some B2C cases as well as to nearly all B2B situations. The overall package of quality as sensed by the customer

¹⁸ David A. Garvin, “Competing on the Eight Dimensions of Quality”, *Harvard Business Review*, Vol. 65, No. 6 (November-December), 1987, pp 100-109. and “Managing quality”, *The Free Press*, New York, A Division of Macmillan Inc., London: Macmillan Publishers, 1988.

¹⁹ Ronald D. Moen, Thomas W. Nolan, Lloyd Provost, *Quality improvement through planned experimentation*, (1st ed.) McGraw-Hill, New York, 1991.

²⁰ Narayanan Ramanathan, “Embedding Sustainability Concerns into Quality Assurance”, *Total Quality Management & Business Excellence*, 2020.

thus includes fourteen dimensions. There is a fifteenth, which are the service attributes – applicable to both products and services, and which needs a list of its own which Garvin’s dimensions did not intend to cover.

Services: One manifestation of modern technological evolution is the transition to a service economy, wherein products may be increasingly offered as intangible services that are leased or “rented” by users rather than as physical assets owned by customers. This classification is being extended from software to apply to automobiles (or, more generally, mobility services), and even to household appliances such as washing machines. This scheme is an incentive for manufacturers to make their products more reliable and durable, and, even more importantly, upgradeable, as they, rather than the user, own the asset. An early example of such a business model would be the Xerox business practice of the early 1970s when they placed their copying machines with users, receiving revenues from the copying service on a price-per-page basis. An additional quality requirement that emerges from such a business model may be termed broadly as recyclability, a set defined here as the ability of the asset to be *reused, recycled, re-manufactured, reassembled*, or better, *upgraded* – an additional set of five dimensions that should be considered as new excursions for the Quality Enlightenment period. These aspects of quality gain additional power in that they also support requirements for sustainability.

Just as nearly all product marketing includes services, whether stipulated in the sales contract or not, products and facilities are integral to many service industries – for example, aircraft, hotel room, software, food, or packaging – and these must meet all the pertinent product quality dimensions. Therefore, in a strict sense, there are almost no ‘pure’ services, not even insurance, consultancies, or brokerages, as they too require some office facilities which may count as delivering ‘ambience’ for customer visits and meetings. A. Parasuraman *et. al.*²¹ identified ten ‘determinants’ – or dimensions – of service quality. These dimensions include *reliability* (meaning *consistency*, and not be confused with freedom from failures), *responsiveness*, *competence*, *access*, *courtesy*, *communication*, *credibility*, *security*, *understanding the customer*, and *tangibles* (appearance of facilities, or ambience). In 1988, the same authors reduced the ten dimensions to five categories (through “repeated iterations”): *tangibles* (including appearance of personnel), *reliability*, *responsiveness*, *assurance* (ability of employees to inspire trust) and *empathy*

²¹ A. Parasuraman, Valarie A. Zeithaml, Leonard L. Berry, “A conceptual model of service quality and its implications for future research”, *Journal of Marketing*, Vol. 49, No. 4, 1985, pp 41-50.

(caring, attention). These five categories were decomposed into 22 sub-dimensions in their research survey.²²

The original ten dimensions of service quality have been retained here for clarity. The dimension of *competence* had meant employees offering a service but must be expanded to mean the competence of automated systems and artificial intelligence. Similarly, the meaning of dimension of *ease of access* should be enlarged to cover installation and operation. The concept of access includes the ease of connecting to service or help. These requirements may be of peripheral importance to technically savvy early users, but are vital for ordinary users, who would not want to navigate through a maze of instruction details.

Besides, the troubles experienced by customers, which represent mis-firing of performance in services, may be classified under six heads, namely, *errors, failures, malfunctions, wrong advice, disturbance and delay* – which are their typical nonconformities. Of these, the degree of *disturbance* to the user - in construction or repairs for example – is a required dimension that is not often considered in quality assurance practice.

Attractive Qualities: All the dimensions named so far relate to customers and users, or society. As such they encompass the three main elements – attractive, one-dimensional and ‘must-be’ qualities - of the Kano model. Thus, features could contain must-be qualities (say, provision of a remote control for a device), one-dimensional ones (fast boot-up), or attractive qualities (which fades in importance over time, such as automated parking which may ultimately become a normal aspect of the mobility experience). Even reliability of a product which would normally be regarded as ‘must-be’ can have an attractive edge – if its freedom from failure is way beyond expectations – a car that never needed any repair in ten years, for instance. Responsiveness to failure and effective recovery from it could be included as one-dimensional features, or even in the attractive category if it is exceptional. Technology companies have observed that customers who have had a problem that was resolved well and rapidly are more likely to buy again than those who did not have a problem in the first place. It is important for managers to continually identify opportunities for offering attractive qualities, and improving one-dimensional ones, even as they defend themselves through sound must-be qualities. It is essential that Quality Enlightenment develop a high level of “imaginative understanding” of the customer environment and gain intimate knowledge about how their products and services create value in the customer domain from the customer’s point of view.

²² Ibid.

Integral Environmental Elements: Additionally, there are sustainability dimensions to the quality equation. These have, in the past, been treated as externalities to Quality, and addressed, if at all, as “nice-to-have” or voluntary environmental concerns and objectives. Some sustainability-related dimensions do overlap with Quality. Thus, lower energy-use could be both related to the quality dimension of economy-in-use, and to that of sustainability as resource conservation. Chemicals in food – preservatives, colours, etc. as well as the more dangerous hormones or antibiotics – could be part of the quality dimension of safety-in-use and also of sustainability – exposure to toxins. Overall, in addition to extending product life through multiple means, at least four clear environmental dimensions arise, which should become an integral aspect of managing for quality. These are: *toxins and (slow-degrading or hazardous) wastes* arising during use or disposal; *emission of greenhouse gases (GHG)* during the life cycle; *extent of use of non-renewable resources* in making the product or in accessories and consumables needed in use; *extent of use of renewable resources* faster than their rate of regeneration.²³ Even if users do not express such needs, these are shared needs of society and must figure prominently in any quality assurance or control system, in addition to the firm’s sustainability plans. The addition of these dimensions as an integral part of Quality Assurance in product development would in fact be relatively revolutionary changes to Quality-related considerations.

Manufacturing: Manufacturing should make products that meet the designed specifications, without non-conformities. ISO 9000 classifies non-conformities as *deviation permits, concession/waiver, repair, rework, regrade and scrap*. Further, *warranty claims, and complaints* (communications about dissatisfaction) can apply to both design and manufacturing flaws in hardware as well as software faults and bugs. Besides, manufacturing, supported by design functions and vendors, must deliver ever-increasing demands on the *fit-and-finish* or *build-quality* of products, as they have a significant impact on perceived quality in addition to being intrinsically valuable as they reflect high design and manufacturing abilities. Subject to being better than minimum requirements, fit-and-finish quality can be considered one-dimensional. The better it is, greater the perceived quality and satisfaction, and possibly trust in the product and its maker.

Sustainability issues during manufacturing can be treated as such and not necessarily as ‘quality’ issues, if the product is not affected – assuming that there is a robust system of deploying such performance indicators in the

²³ Narayanan Ramanathan, “Embedding Sustainability Concerns into Quality Assurance”, Total Quality Management & Business Excellence, 2020.

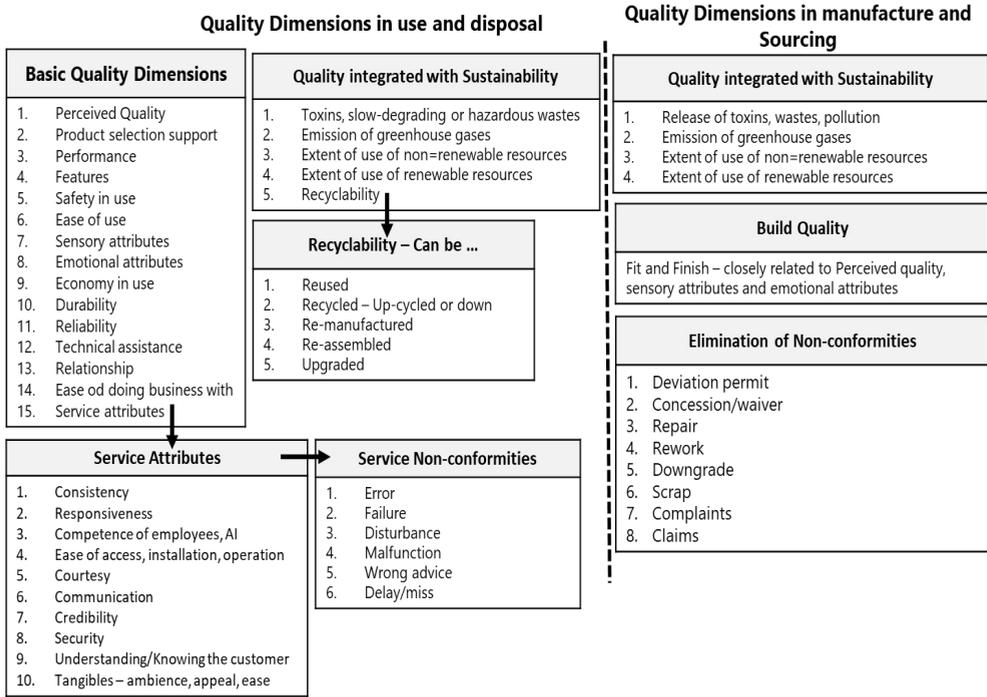
plant as part of a Quality Management System. Thus, hexavalent chromium used in plating of steel may be deadly for employees and the local communities, but the resultant product may be safe to use. Emissions arising in manufacturing may also be treated as a sustainability issue, as can also the use of resources such as water, fossil energy, or the release of GHG. Increasingly however, institutional investors as well as consumers of such products might insist that no harm should have been caused during its manufacture, in which case the dimensions of *pollution* (release of toxin), *waste* disposal, GHG, or *resource use* become additional “enlightened” quality dimensions.

Checklists Starting with Design: These expanded dimensions of quality, constituting a new typology, can be utilized as checklists for product and process design, especially in the early stages of surveys and concept designs. The actual needs under each dimension would vary according to the specifics of each product or service. At the design stage, the typology could assure that nothing of importance is missed out either with reference to benchmarks, or competitive offerings. Additionally, satisfaction surveys must be designed to validate the metrics for each relevant quality dimension that defines an organization’s product or service offering. This practice is well advocated by survey practitioners like Bob Hayes²⁴, who use need-statements as subsets of dimensions and determine relative importance statistically. The methods of Hayes, however, have not needed a typology of dimensions, as they are applied to satisfaction surveys only. But if such a typology were available, the designs of satisfaction surveys could become more fool-proofed.

The Proposed Quality Dimensions Typology: In short, Quality Management needs a comprehensive cataloguing of dimensions that matter to customers, users, and society, so that these dimensions are designed into processes and products to assure that the end-to-end supply chain is kept environmentally safe. A complete list of all the proposed expanded quality dimensions, flowing from the preceding discussions, may be found in Table 2.

²⁴ Bob E. Hayes, “Measuring customer satisfaction and loyalty”, *ASQ Quality press*, USA, Milwaukee, 2010.

Table 2. Typology of Proposed Quality Dimensions



As explained earlier, the basic quality dimensions, expanded from Garvin’s eight, are fifteen in number. As many as ten dimensions describe Dimension #15, Service Attributes, constituting a powerful subset, besides a set of six dimensions comprising nonconformities in service. Five sustainability dimensions are sought to be enmeshed with the fifteen Quality dimensions. The last of these, recyclability, is expanded into a subset of another five, each of them vital for Quality in the 21st century. Separated by a vertical dashed line, dimensions pertaining to manufacturing and sourcing are catalogued. These include build-quality-fit-and-finish-besides four dimensions related to quality-sustainability. Then there are eight types of manufacturing-related nonconformities, distinguished from service-related nonconformities. The table, in short, is a new typology of Quality dimensions that can be applied universally to any product or service, including those from the Digital world.

5. A MEASURE OF CONCEPTUAL VALIDATION FOR FUTURE PRODUCTS AND SERVICES

The multitude of emerging technologies businesses may be music to some; and “hype” to others. In any case, these new technologies are probably inevitable. It is about certain that streams of new products, services, and features are under development, attracting first those pioneers who seek applications for cutting edge technology, and then diffusing into the larger population. It is in the nature of these technologies that they often are in dematerialized form (music or books, for instance). As a bonus, these characteristics align with sustainability. Quality professionals need to elevate the level of their active engagement in these developments, as partners and significant contributors to the design and development process, rather than stand sidelined as peripheral survivors.

The new framework in Table 2 is conceptual, not having been tested statistically or empirically yet. The framework will be judged by how it stands up, in particular, to the new technological developments. A measure of conceptual validation is attempted here with respect to automobiles and digitalized products.

Quality Enlightenment and the Automobile: There is an ongoing revolution in automobile technologies. Though electric cars have taken a lead in this transformation, top automotive executives are keeping options open about possible alternative technology trajectories, which not only include hybrid vehicles, but also hydrogen-powered and fuel-cell powered engines, especially for trucks. Electric cars might seem eco-friendly, but they will only achieve this result if their batteries are charged from renewable energy sources, the human tragedies in lithium mining are avoided, and end-of-life disposal does not lead to a nightmare of wastes and toxins. A digital world is bringing intelligence to cars. Not only is autonomous driving a likely reality, but cars will have intelligent elements, including tyres, navigational aids, and temperature and ambient air control. Every one of these developments will benefit from precise need identification and preventive actions that Quality must deliver. A single accident to an autonomous vehicle trial can set its development back for years. It is unclear how quality professionals have been involved with developing preventive steps and countermeasure protocols when AI algorithms are designed for cars, or in developing efficient and eco-safe energy sources. But such involvement is warranted.

Table 3. Requirements from a car and Quality Dimensions

Quality Dimensions / Quality Requirements	Economy in use	Durability	Safety in use	Ease of use	Resource use	Toxins and wastes	GHG release	Recyclability
Weighs a small fraction of today's cars	○				○	○	○	
Is accident proof			○					
Uses no fossil fuel					○	○	○	
Needs no driving			○	○				
Needs no replacement of parts	○	○		○	○			○
No toxic substances or off-gassing						○		
Re-manufacturable, upgradable								○
Degradable						○		
Emission equal to ambient air						○		

Consider a car that weighs only a fraction of what they weigh today and remains utterly safe. It would not need to move a ton-and-a-half to carry a passenger weighing 80 kilograms. Thus, the design can eliminate the excessive *muda* (waste) in resources used in manufacture as well as the energy consumed for moving this additional weight. The car of the future would consume no fossil fuel in its manufacture or use. It would be a smart car – suddenly, driving skills of human operators would no longer be needed. All its parts, including tyres and filters, would last the life of the car, or could be maintained or recycled to do so. It would use or release no toxic substances, and at end of life it would be mostly capable of re-manufacture, re-assembly and upgrade, and whatever component is not, would be biodegradable. Finally, if it released any exhaust at all, it would not be worse than ambient air.

Investigating further the development of automobiles from first principles and applying some of these newly proposed quality dimensions, a new set of specifications that convert conventional wisdom on its head can conceivably be devised for future automobiles. Table 3 identifies some of these concepts that may become design demands for automotive designers and links them to eight of the dimensions from the framework, including four that overlap with sustainability.

Quality Dimensions for New Detergents: Consider the detergents that are used for dishwashing or cleaning clothes. Already there are trends to-

wards eco-friendly products using enzymes. Future detergents must be made free of phosphates and other chemicals that enter groundwater, and for their efficacy, they must consume less water than now, and require no heating of water beyond, say, 20 degrees Celsius. These are the new quality dimensions of importance to sustainability for both the washing machines and the detergents.

Quality Dimensions in Digital Products: Take sensors, which will be ubiquitous in every factory. They support the Internet of Things (IoT) and should be designed to alert when either the process is out of statistical control, or a process operating condition falls outside the limits established by quality designers based on data accurately analysed over representative operating periods. Specifying these statistical and operational limits is the job of the quality professional working together with design and technology subject matter experts. A key quality dimension involved would be the competence of employees or systems.

Consider the personal computer. It has advanced to provide features that recognize faces, provide digital assistants, and monitor Internet streams. It is faster, and has more diverse applications (performance dimension). It is easier to use than in the past, and is lighter, and brighter. But when a PC has any trouble, the user faces an opaque system, with manufacturers or service providers largely inaccessible or offering unhelpful tips online without necessarily understanding the problem. Future software-hardware combinations must be able to identify and diagnose the fault precisely, proactively acknowledge it, and either solve it automatically through AI, or take the ordinary user through clear steps that provide definitive cure. Quality professionals should help identify and insert such requirements at early-stage designs to prevent flaws, faults, and failures from affecting users.

6. AN ERA OF GLITCHES

Products and features which deliver new technologies have tended to be susceptible to errors, glitches, bugs, or problems that are tolerated by advanced users and early-adopters who want to investigate application of these advanced features and can afford to ignore a few troubles. While it seems to make sense to release products early, without trying to perfect them, unfortunately, many of these early troubles stay unresolved and are encountered by subsequent users as products migrate into mass market, and less sophisticated people become engaged. What is more, searches for solutions on the Internet

often direct users to fellow-users who proffer confusing advice, while opaque company ‘Help’ and ‘Support’ desks can be unhelpful.

Thus, while new technologies have delivered attractive qualities at rates encountered never before, their ‘must-be’ quality characteristics are often suspect. Though many of the troubles that users experience may be merely annoying, they can also be intimidating. The billions of dollars invested into depersonalized contact centres and helpdesks often seem to leave final consumers displeased. So ubiquitous are these irritations that a generation of consumers has grown to expect them. Technology hassles have become a new normal, converting digital frustration into a way of life.

Where data is either the major ingredient or final product – as occurs with Big Data – poor data quality, pedigree and integrity are issues where it would be natural for quality professionals to contribute and discover solutions.²⁵ Dashboards rarely seem to distinguish between special and common causes and fail to identify potential opportunities for improvement. Likewise, IoT alerts pop up in high frequency to both operators and their supervisors, accentuating a growing attention deficit syndrome in society. Management must react only to significant alerts and not to minutiae that change intermittently.

Other problems have been created and must be managed. One is the threat of ruptures in cyber security. Technology problems may even create loss of life. The two crashes of the Boeing 737 Max aircraft killed 346 people. Their cause appears to be a defective automated system actuation in response to a remote sensor observation. Instances such as this highlight the need to go beyond reliance on corrective and preventive action taken after a problem is observed. In the new product development process, designers must identify countermeasures to high potential failure modes as well as those characterizing of the situation that triggers or initiates this state. If glitches are allowed to proliferate, advancements in technology may get neutralized.

7. A CLARION CALL FOR RECIPROCAL ADJUSTMENT

Two-way involvement: Suddenly, there are technologies and businesses that did not exist just a decade ago, but they seem to lack the quality vocabulary and methods that permit them to define and deal with their problems, and they do not always acknowledge this lack of sensitivity. As a result, Qual-

²⁵ Ronald D. Snee, Roger W. Hoerl, “Inquiry on Pedigree”, *Quality Progress*, Vol. 45, No. 10, 2012, pp 66-68.

ity professionals have a dual role. First, they need to work with the process of large-scale creation of attractive qualities in the arena of these technologies, Secondly, they must work on preventing user troubles from occurring at all. This is the bread-and-butter of traditional approaches to quality management. In parallel, those introducing these technologies must also acknowledge the potential risks of failure in their creations and embrace the philosophies, principles, and improved methods and systems of Quality. Together they must collaborate to assure that quality is delivered in all of its relevant dimensions.

Reciprocal Adjustment: This concept of group collaboration is not a new thought. Mary Parker Follett²⁶ urged professionals “not to adapt ourselves to a situation – we are all more necessary to the world than that; neither to mould a situation to our liking – we are all ... of too little importance for that; but to take account of that reciprocal adjustment, that interactive behaviour between the situation and ourselves which means a change in the situation and in ourselves.”

So, two tracks must meet. Such a confluence would be the dawn of Quality Enlightenment. The first track is for Quality professionals to work closely with the new businesses, consolidating the expanded dimensions of quality and applying them to all stages from design onwards. These dimensions should be used both for creating attractive qualities and for preventing disruptions from failures. The second track is for these new businesses and technologies to genuinely adopt Quality as a fundamental ingredient in their mainstream processes.

A clarion call is a clear call to singular action that is so evident that there is no question that it is necessary and essential – it is an appeal or imperative to act and change. This call requires that society adopts quality and that quality professionals serve society. The call here is for reciprocal adjustment.

8. CONCLUSION

This conceptual paper has laid out a comprehensive framework for the Dimensions of Quality – a model that goes beyond existing models. The model is set in the context of a changing world with breath-taking new developments. When Practitioners in diverse new fields work together with competent, clued0in Quality professionals, the way is paved for Quality Enlightenment.

²⁶ Mary Parker Follett, *Scientific Foundations of Business Administration*”, *Dynamic Administration*, Henry C. Metcalfe, and Leon Urwick, eds., 1940, New York: London: Harper, 1925.

Only a limited conceptual argument has been provided to justify the model with respect to emerging products and services. A cautionary flag has been raised about the trend towards glitches in new technology products. The theoretical model may be treated as a beginning. The framework is meant to serve as a basis for future empirical and statistical work on the subject.

Sažetak:

KVALITETNO PROSVJEĆENJE I NOVA TIPOLOGIJA DIMENZIJA KVALITETE

Svrha ovog konceptualnog rada je razviti, u kontekstu evolutivnog procesa prosvjeđivanja kvalitete, novu tipologiju dimenzija kvalitete s univerzalnom primjenom u dizajnu i razvoju različitih vrsta proizvoda i usluga, uključujući one koje proizlaze iz novog digitalnog Svijeta, a također se bavi pitanjima održivosti kao sastavnim dijelom kvalitete. Dimenzije kvalitete predložili su David A. Garvin, A. Parasuraman i drugi. Pristup u ovom radu je konsolidacija ovih dimenzija, u svjetlu povijesne evolucije, s dodatnim dimenzijama temeljenim na razmatranjima vezanim uz održivost okoliša, digitalnu transformaciju i utjecaj drugih naprednih tehnologija. Dodatne dimenzije predstavljaju proširenu ulogu za profesionalce u kvaliteti, zapravo za sve profesionalce koji rade na proizvodima i uslugama, spoj koji je bitan za kvalitetno prosvjeđivanje. Konceptualna tipologija generičkih dimenzija koja se može koristiti kao kontrolna lista za odbijanje potrage za specifičnim potrebama kupaca i društva razvijena je kao okvir za profesionalce u kvaliteti, dizajnere, proizvođače i pružatelje usluga u prosvjeđenoj budućnosti.

Ključne riječi: prosvjećenje kvalitete, tipologija dimenzija kvalitete, kvaliteta usluge, održivost, digitalizacija, atraktivna kvaliteta.

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INSPIRING LEADERS TOWARDS A HIGHER PURPOSE: A NEW QUALITY ERA

INSPIRIRANJE VOĐA PREMA VIŠOJ SVRSI:
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ABSTRACT

The discussion amongst leaders and quality professionals as to whether effective quality management practices can be linked to higher profit has been the subject of much research and debate over many years. However, a new debate is growing momentum; that is whether “purpose” should come before profit. The competitive landscape is such that it is forcing leaders to embrace complex and challenging issues relating to legislative, social and environmental factors. The ability to sustain and compete in this landscape demands a more holistic approach to strategy. There is a danger that given these pressures impetus towards quality management declines. This paper explores the principles and practices of strategic quality management and the key role that these capabilities can play in addressing these challenges and argues that there is never a more appropriate time to elevate quality management to a strategic level. The author uses an interactive research study conducted with businesses in order to develop and report the findings.

Key words: competitiveness, sustainability, strategic quality management.

1. PURPOSE BEFORE PROFIT

The impact of the global pandemic on competitiveness and sustainability such as the pandemic felt by many organisations is well-documented, including economic and supply chain issues and logistics. Another dimension that is clearly growing in weight is the impact on the behaviour and expectations of “people”, i.e. the human dimension.¹ Clearly the pandemic has increased the importance the organisation places on delivering value to society. As consumers and participants in the new global economy there is an intolerance of unethical practices and through social media immediate exposure of company failures in this regard. In addition, there is a push for greater transparency. Current research of the impact of post covid-19 pandemic on businesses supports a more “humanistic” approaches to leadership.

What do we mean by a “higher purpose”? This imperative has been explored by several renowned authors and researchers. That is “... a prosocial contribution goal that transcends the usual business goals like profit maximization, but is intrinsically a part of the business of the organization. Not about economic exchanges but something more aspirational” and conclude that “discovering the purpose” as a “collective creation” reflecting the values of the organisation can be defined as “authenticity”.² The “purpose” should embrace the wider societal and environmental issues and tap into the people power of organisations including internal and external stakeholders and wider communities. The UN Sustainable Development Goals 2030 initiative emphasises the importance of people and planet urging nations and companies to be proactive in working towards these goals.

2. THE CASE FOR QUALITY MANAGEMENT: CURRENT RESEARCH

The relevance of these aspirational factors to higher purpose and authenticity may at first sight be considered to be a challenge for leaders and quality managers partly because of the difficulty with quantifying these issues and difficulty in measuring and improving them therefore. Two significant

¹ David Schonthal, *The Human Element Overcoming resistance that awaits new ideas*, Wiley, 2021.

² Anjan V. Thakor, Robert E. Quinn, *Higher Purpose, Incentives and Economic Performance*, European Corporate Governance Institute – Finance Working Paper 706/2020, 2020. Available at SSRN: <https://ssrn.com/abstract=3350085> or <http://dx.doi.org/10.2139/ssrn.3350085>

international surveys with the aim of assessing the current status and impact of various strategic challenges on quality management have revealed similar findings. The Chartered Quality Institute identifies four major trends that drive change and influence the development of quality management principles, methods and tools: global trade – the changing landscape of geopolitics and markets and supply chains, technology – citing in particular Quality 4.0 technologies relating to artificial intelligence (AI) and robotics as well as impacts of social changes on the work environment, and lastly, personal and societal values - expectations for responsible practices that reflected ethical decision-making and behaviour. This “vision for change” requires a more strategic, holistic skill-set from leaders and quality managers. This vision for change is highlighted again in a recent study by Boston Consulting Group (BCG) in partnership with the American Society for Quality (ASQ) whose research emphasises that success, in terms of competitiveness, requires a transformational “multifaceted approach” that addresses strategic, cultural and technological issues arguing that advances in technology alone is insufficient. Both studies highlight the need to address the “human” factors such as trust and guardianship, agility and adaptability, new behaviours and roles. The need for leaders to strive for a higher purpose is gaining momentum because it embraces societal and environmental sustainability issues. In terms of looking for help in moving the quality agenda forward, the researchers³ argue the need to “revitalise” quality management and suggest that the way forward should be an interactive research study engaging with practitioners.

3. THE AUTHOR’S ACTION RESEARCH STUDY

The author has had the opportunity to observe first-hand the pressures facing businesses in the post-pandemic world through an action-learning study of 50 small to medium enterprises and an international study of public and private sectors taking place over a two-year period. The study enabled the author to evaluate the extent to which the principles and practices of quality management provided a powerful vehicle with which to educate leaders in order to sustain and grow their businesses. The author was instrumental in the design and delivery of this “Grow” programme engaging with participants from a broad range of industries, from small family owned companies to large

³ Anders Fundin, Johan Lilja, Yvone Lagrosen, Bjarne Bergquist, “Quality 2030: quality management for the future”, *Total Quality Management & Business Excellence*, (2020) DOI : 10.1080/14783363.2020.1863778

international businesses: thus provided an opportunity to work directly with business leaders in meeting the challenges facing them now but also developing the capability to grow their businesses. The question was “to what extent could key capabilities such as quality management principles and practices inspire leaders to a “higher purpose”? Some examples follow of the results of this action-learning study.

4. POST-PANDEMIC COMPETITIVE ISSUES

Firstly, it was important to identify the strategic management issues emerging during the research study. These can be summarised as follows:

- Volatility of the marketplace – caused by uncertainty in availability of materials, supply chain vulnerability, capacity management and resilience to survive as a business;
- Organisational structures and processes designed for control and stability were unable to adapt and be sufficiently agile to respond to customer demands;
- Whilst companies all identified “quality” as being critical in terms of customer value, they did not measure it and leaders had difficulty in understanding their value chains, particularly where value flowed and where it was lost.

As to the future, leaders believed that in order to sustain their businesses and to achieve the stability for growth, they had to focus on their own role as leaders, recognising their own development needs in developing a strategic vision for their business. This necessitated re-framing their vision and mission statements into a more purposeful statement that embraced wider economic and societal aspects. In so doing, they learned to engage with internal and external stakeholders including their supply chains.

5. AN INTEGRATED LEARNING MODEL

The author’s previously published research studies into the prevailing culture in organisations supports the views of a wide range of commentators that, in order to achieve the transformational change required, many barriers needed to be overcome. Such barriers included those resulting from hierarchical structures where decision-making and power was bureaucratic and slow to respond and adapt, where innovation and creativity was not encouraged

and rules and procedures dominated.⁴ Quinn and Thakor⁵ suggest that focusing on a higher purpose moves away from transactional oriented mind set towards a purposeful mind set. The culture encourages engagement and recognises value within the human capital of the organisation.

The integrated learning model developed by the author⁶ provided an holistic framework with which to address the development needs of leaders in tandem with meeting the organisational development needs. This concept of this model was originally developed by Wilber K.⁷ as a framework with which to understand relationships between wider psychological factors. More recently it has been adapted and applied in a number of sectors as a leadership development model, including, for example the health care service, where there was a need for more holistic leadership qualities in professionals.⁸

The principle of Wilber's model is that it focuses on four integrated facets of the leader as follows: The upper left-hand quadrant contains the individual's internal experiences and relates to the perception of the individual. (The "I") and relates to the core values held by the leader. The upper right-hand quadrant contains the factors influencing the perception of the individual from outside (the external view). Such perceptions will be influenced by actions, language, skills, competencies and body language. (The "It"). The lower left-hand quadrant represents the group consciousness and embodies the cultural context within which the individual is placed. (The "We"). The lower right-hand quadrant represents the socio-economic context within which the organisation is placed, called. (The "Its"). Wilber's theory is that the model demonstrates the inter-relatedness between each of the four aspects of the "human" dimension and, argues that it follows therefore, that an issue affecting one quadrant will impact upon the other three quadrants – thus forming an integral view. From an integral perspective transformation can only occur through mindset transformation.

⁴ Marilyn Dyason, "The Future of Quality: Sustainability and Competitiveness", proceedings 20th International Symposium on Quality, *Quality – yesterday, today, tomorrow*, Croatian Quality Managers Society, Pula, Zagreb, Croatia, 2019, pp 1-8.

⁵ Anjan V. Thakor, Robert E. Quinn, Higher Purpose, Incentives and Economic Performance, European Corporate Governance Institute – Finance Working Paper 706/2020, 2020. Available at SSRN: <https://ssrn.com/abstract=3350085> or <http://dx.doi.org/10.2139/ssrn.3350085>

⁶ Marilyn Dyason, "Integrated learning strategies: new approaches to educating leaders in strategic quality management", *International Journal of Quality Research*, University of Kragujevac, Serbia, 2021.

⁷ Ken Wilber, *A brief history of Everything*, Boston, Shambhala, 1996.

⁸ Barbara Scala, Claire Frances Lindsay, "Supply Chain Resilience during Pandemic Disruption: Evidence from Healthcare", *Supply Chain Management*, Vol. 26, No. 6, 2021, pp. 672-688. <https://doi.org/10.1108/SCM-09-2020-0434>

Figure 1. Applying an integrated learning model to the case studies



Source: Dyason, 2021.

6. THE QUALITY SKILLS AND KNOWLEDGE GAP

Research shows that education of leaders, particularly in the context of quality management, emphasises the skills and knowledge of typical tools and techniques but many quality initiatives fail to be fully embedded into the core and heart of the organisations values and culture and therefore lack sustainability. Whilst some leaders were familiar with quality management concepts such as “lean” and six-sigma, many had experienced them as “initiatives” and the interventions fail to have a lasting impact or to be embedded in the organisational culture.

The Chartered Quality Institute recently published the results of an international survey of 500 members. The finding offer key insights into where members feel their development needs lie in relation to “ESG” (Environmental, Social and Governance factors). Only 38% had a strategy for evaluating their awareness of these factors. Whilst members were committed to helping businesses deliver their environmental, social and governance goals they did not have the skills or knowledge to do this. In general organisations were found to be lagging in their development of strategic plans for how quality could be better managed in an increasingly digital age.

7. USING THE INTEGRATED LEARNING MODEL TO CLOSE THE GAP

The first step was to use the quadrants of the model relating to the “Interior” – the “I” (the leader) and “We” (the culture) through which leaders reflected on their own leadership values and how these were reflected within the culture of the organisation. Moving to the external “collective” quadrants relating to the “IT” (the perception from outside the organisation) and the “ITS” (the socio-economic environment): leaders evaluated the extent to which the four quadrants were integrated and whether the core values and culture supported the sustainability and future direction and growth of the company. The following capabilities were identified as essential to make a transformation to a higher purpose.

8. RESEARCH FINDINGS: NEW QUALITY ERA CAPABILITIES

The findings revealed a number of strategic capabilities that were found to be particularly relevant and powerful in driving forward the required transformation. These were underpinned by tried and tested quality management principles and practices but integrated in a way that provided the “multifaceted” approach required for survival and competitiveness. The study highlighted the importance of the “human factors”, particularly in relationship building internally and externally more widely in order to focus on a “higher purpose”. Practical examples can be seen below (Table 1. Case Study Examples).

8.1. Demand-led supply chain

From an exterior perspective it was necessary for leadership to embrace the demands of globalisation and to develop relationship skills across a diverse and wide-ranging network of suppliers. The concept of “supplier demand-led configuration” gave companies the flexibility to switch between suppliers in order to personalise products or services for example. Thus, the supply chain was personalised according to the needs of different customer groups. Opportunities for collaborations were opened-up with new product and service innovation. Organisations that focused on cost reduction and operating costs rather than customer experience will inhibited their ability to implement the most effective operating system. Whilst the benefits of cost reduction and reduction in operating costs was leveraged from the implemen-

tation of a successful demand driven supply chain it was not the main driver, rather the desire to operate a demand driven supply chain was a leadership decision that supported the company's strategy.

8.2. The organisation within an eco-system

The organisation as an eco-system is characterised by one that leverages networks and collaborations to create business value. A united vision towards a “higher purpose” provided an opportunity for synergy between businesses in similar or different industries. Eco-system thinking enabled companies to build products and services around lifestyles which required a wide and complex understanding and anticipation of societal needs. Co-creation across industries led to more innovative approaches to services and products.

8.3. The circular economy

The concept of process management, value adding steps within the supply chain and reduction of waste through concepts such as “lean” were re-framed within the concept of the “circular economy”. Its premise is based on the knowledge that traditional linear economic models are reaching their limits and the availability of cheap, easily accessible materials and energy can no longer be taken for granted. It supports waste prevention and is built upon the premise that the business model “take, make dispose” is no longer a sustainable approach. The quality management standard BS8001 published in 2017 provided a practical framework with which to stimulate dialogue with stakeholders. The circular economy is based on three principles, driven by design): eliminate waste and pollution, circulate produces and materials (at their highest value), and regenerate nature. It is underpinned by a transition to renewable energy and materials.⁹

8.4. Emphasis on the customer experience

Embracing the intangible aspects of the customer experience was agreed to be key and its necessity fuelled by the availability of social media. Whilst customer satisfaction surveys still provided the basis of quality improvement initiatives in many organisations, it was acknowledged that it was time to look beyond the immediate satisfaction towards meeting lifestyle aspirations

⁹ Ellen Macarthur Foundation, “The Circular Economy retrieved from Ellen Macarthur Foundation”, website 2020. <https://ellenmacarthurfoundation.org/>

and to identify changing needs and expectations, particularly in highly competitive industries: in such cases this was an insufficient indicator of future growth. Data that capture a wider source of feedback was key to the design of new services and products.

8.5. Digital technology as an enabling tool

The way people and data work together was an essential component of optimising the power of digital technology. A clear rationale and opportunities to increase customer value were identified to drive the use of technology rather than the reverse. Ethics and trust were considered to be important aspects with transparency a fundamental part of authenticity. This could be achieved through the co-creation of products and services within the wider eco-system that shared similar values.

9. SUMMARY OF RESEARCH FINDINGS WITH EXAMPLES

This methodology paved the way for leaders to be more forward thinking and ambitious in their strategic focus. Not only did they feel that they were overcoming some organisational barriers identified earlier in terms of culture and structure but also felt empowered and skilled to bring about the transformation required. Particular urgency was felt to address the competitive issues which in the post-pandemic world were critical to survival.

Table 1. Case study examples

Business/competitive pressure	Higher Purpose	New Quality Era Capabilities
Coffin manufacturer (competition from others in industry)	Core values: Dependability Building lasting relationships Offering individual farewells	Eco-sourced materials. Partnering with other businesses in the industry to build lasting relationships (bereavement counselling etc. Personalisation of product. "Make your own coffin" initiative
Aerospace military components design (newly independent company)	Core Values: Highly skilled engineers Providing an essential edge to protect what matters most	Innovation fuelled by economic development and scientific research (including space components). Leading socially responsible initiatives such as supplying food supplies using logistics capability Collaborating with customers in the design of new products and services
Railway network (cross-rail) Environmental pressure. Technological complexity	Core values: Innovation, technological and engineering expertise To harness the innovation and learning in project management to benefit other construction projects	Partnering with other transport providers, focusing on customer experience and expectations. Strategic eco-system planning encompassing environmental issues. The learning Innovate18 provides an opportunity to capture and explore pioneering ideas from all of those involved in the project. The techniques, products and methods used on Cross rail are providing a benchmark for other construction projects.
Printing company (competition from on-line companies)	Core values: Trust, speed, dependability Providing fresh ideas and creative communication solutions to clients	Using technology to add value to customers through personalisation of materials enables wide product portfolio Part of a social enterprise which ploughs all its profits back into the business. A key part of their mission is to provide employment for people with learning disabilities or mental health issues. One stop shop through the delivery chain offering design print and delivery All materials from environmentally friendly sourcing and re-cycled
Mobile phone provider (competition from others in industry)	Core values: Reliability, innovation Providing a strategic customer experience through communications	Using technology to connect with other providers in the supply chain to create a unique communications experience. Extensive re-cycling effort across all stages of the life-cycle of the product and service.

Table 1. provides an illustration of some companies in the sample and how they elevated their company’s strategic focus to a higher sense of purpose though this action-learning approach. It was evident that the quality management discipline underpinned values and outcomes.

10. CONCLUSION: A NEW QUALITY ERA?

Leaders and quality professionals are very familiar with the term “quality eras”, and “quality maturity” a concept originally researched by the authors and continuing to be widely cited today.¹⁰ More recently there is the concept of Quality 4.0. However, striving for the characteristics associated with eras and maturity remains a challenge with many leaders continuing to express frustration about the barriers, including lack of senior leader involvement and bureaucratic cultures. This, together with the volatility of the

¹⁰ Michael Kaye, Marilyn Dyason, “The Fifth Quality Era”, *TQM Magazine*, January, Vol. 7, No. 1, 1995, pp. 33-37.

market, posed strategic risks and competitive pressures which could all be addressed simultaneously through the study. It was evident from the above research study that leaders gained inspiration from the practical engagement of the methods, particularly when they were able to identify those appropriate to their business needs for sustainability and growth. Indeed, the challenge for quality professionals in particular is to reframe a focus and emphasis on efficiency and productivity to a language that is more human-centred and giving more weight to resilience and adaptability which can only be achieved with people's commitment and engagement. The "higher purpose" as a driver naturally embraced the human aspects: perhaps the next era could be termed "quality as a higher purpose".

Abstract:

INSPIRIRANJE VOĐA PREMA VIŠOJ SVRSI:
NOVOJ ERI KVALITETE

Rasprava među vođama i stručnjacima za kvalitetu o tome mogu li se učinkovite prakse upravljanja kvalitetom povezati s većom dobiti predmet je mnogih istraživanja i rasprava tijekom mnogo godina. Međutim, nova rasprava dobiva sve veći zamah; odnosno treba li "svrha" biti ispred profita. Konkurentsko okruženje je takvo da tjera lidere da prihvate složena i izazovna pitanja koja se odnose na zakonodavne, društvene i okolišne čimbenike. Sposobnost održavanja i natjecanja u ovom okruženju zahtijeva holistički pristup strategiji. Postoji opasnost da s obzirom na te pritiske padne poticaj za upravljanje kvalitetom. Ovaj rad istražuje načela i prakse strateškog upravljanja kvalitetom i ključnu ulogu koju te sposobnosti mogu odigrati u rješavanju ovih izazova i tvrdi da nikada nije prikladnije vrijeme za podizanje upravljanja kvalitetom na stratešku razinu. Autorica koristi interaktivnu istraživačku studiju provedenu s poduzećima kako bi razvila i prezentirala rezultate.

Ključne riječi: konkurentnost, održivost, strateško upravljanje kvalitetom.

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FEATURES OF CONTEMPORARY MANAGERS AND LEADERS

ZNAČAJKE SUVREMENIH MENADŽERA I VOĐA

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ABSTRACT

The modern world is becoming more and more complicated and it is changing rapidly. The digital revolution and technological progress have radically influenced the way we work and establish relationships. Along with global changes and the ongoing social and generational changes, the existing business paradigms have also changed, and the portrait of an effective leader has changed. The market today needs a new model of leadership competences.

Key words: manager, leader, management, Industry 4.0, VUCA model

1. INTRODUCTION

There are many concepts and theories showing how to run a company in order to achieve the assumed results. In a dynamically changing environment, however, it is difficult for leaders to choose one of them and stick to it for a long time. Ongoing digital transformation of business operations, the evolving expectations of employees and stakeholders mean that the process of change never stops. Leaders are aware of the potential technology that allows them to precisely reach the offer tailored to the needs of the recipient, so that they are able to achieve competitive advantage. The necessity to change business models is a response to technological progress. A modern leader should not only observe market trends.

The key is to try to overtake them, to predict the best direction of development, which is forced not only by the ongoing digital transformation, but also changes taking place in societies. The new reality affects customers, users and consumers, but also leaders of business organizations. Young people entering the labor market have strongly defined expectations as to how they want to work and what products to receive. These preferences affect the way companies operate and their internal culture.

An effective leader is one who realizes that he cannot know everything. That is why he needs trusted co-workers with different competences, skills and experiences. There are many situations where decisions cannot be made authoritarian and it is necessary to trust specialists in a given area. It is this departure from hierarchy that leaders of the 21st century must learn. Leadership is effective when it is adapted to the current needs and leads to the expected result. A good leader must be able to combine various management models, which means that he should be both a charismatic speaker and an enforcer of procedures and schedules. In addition, it is important that the leader must follow trends and respect others while promoting diversity. The leader should by his attitude authenticate the values on which his company is based. Transparency and a sense of influence on decisions made as well as awareness of the motivations behind the leader's actions make people believe in what they are doing. Only such a model of leadership leads to success in the modern world.

Based on the study "Leadership of the Future. Polish leader ready for changes?" the activities of contemporary leaders were analyzed in areas that are significant to them: new technologies, the specificity of future leadership, shaping strategies, as well as relations with the external environment. In doing their business, leaders progress often according to certain habits, patterns and

habits that so far have been bringing the expected results. Organizations today face an enormous challenge. The noise of information and possible action scenarios often make it difficult to make the right decision.¹

Above all, leaders should constantly ask themselves how digital technologies will change a sector in which they have a strong position today and make quick decisions. The challenge in this case is often the size of the company, so large organizations with rigid processes are more exposed to competition from new technological players as part of the so-called “fourth industrial revolution”, often referred to as Industry 4.0. The countless combinations of people, things and machines are the key elements of this change. Thanks to the Internet, new products and services are created. Individual devices can communicate with each other, thus coordinating the production process. It is not only technological progress that contributes to the necessity to constantly modify business management models.

Huge changes in societies also have an impact in the form of generation Y which is characterized by wide application and a good understanding of technological innovations. They are usually people open to changes, much more flexible than their predecessors, but at the same time valuing independence. They expect the work to enable them to continuously develop as well as gather international experience. Under the influence of the above-mentioned trends, leaders gradually change the way they manage organizations. This happens at different rates in different areas, however there are some specific goals they want to achieve.

Delegating responsibilities in companies is becoming more and more important. It is of great importance as it influences the change of the decision-making model. At the same time, in many cases, employees are invited to co-decide on the direction of the company’s activity.

It is facilitated by the departure from a multi-level, complicated organizational structure, which is replaced by structures enabling direct interaction with all management levels, giving freedom and space for experimenting and proposing ideas and innovations. An important role is played by acting for diversity understood as building teams of people with different competences, views and methods of operation. Different views and experiences of colleagues allow them to go beyond the learned patterns of thinking and force them to break the routine, and thus have an impact on the growth of innovation.

¹ Anna Sieńko, Piotr Łuba, Ewelina Niewińska, B. Lenarcik, M. Hankała, „Polski lider gotowy na zmiany?”, *Przywództwo przyszłości*, PwC Polska, 2016.

Leadership is not limited only to the sphere of innovation. Determining the company's value and acting in accordance with them is the axis of the development of modern leadership. This is related to, among other things, offering high-quality products. It is also important that the organization presents a transparent method of operation, clearly defined rules of employing employees, as well as precisely marked sources of origin of the materials used in the production.

2. FEATURES OF POLISH MANAGERS

The world of Polish business is characterized by people who can be described as real leaders. They are an inspiration for entrepreneurs starting their adventure with business. Research report entitled The "Profile of the Polish business leader" characterized the business leader in Poland. The average age of Polish owners of the 100 largest private companies is 58 years. Nearly 60% assessed that business education turned out to be unnecessary to be an effective leader. Leaders are, first and foremost, scientific minds. About 86% of Polish business leaders employ their relatives. The statistical Polish leader was employed full-time for the first 7 years of his career, and at the age of about 30 he started running a business. It would seem that one of the key elements contributing to being an effective leader is managerial education. According to the calculations of Grant Thornton and HSBC, only one in four of the largest Polish business leaders, who usually obtained it while running their business, has economic education. On the other hand, as many as 60% of owners of the largest companies in Poland have completed strict, technical or medical studies. In this group, the percentage of people who run a business in the industry related to their education is the highest (68%).²

The turn of the 80s and 90s was the perfect moment to start business activity in Poland. The beginnings of the period of economic and political transformation were a very good time to start a business. The competition in many industries was low, foreign concerns were just beginning to build their position on the Polish market. Nearly 54% of business owners started running a business in the years 1989-1996. As many as 88% of the owners of the largest companies in Poland still operate in the same industry in which they started their professional careers. The owners of the largest companies in Poland are people who value family values and try to involve family members in the activities of their companies. The Polish business leader is on average

² Tomasz Wróblewski, Michał H. Mrożek *Profil polskiego lidera biznesowego*, Grant Thornton, 2020.

nine years younger than his foreign counterpart (58 and 67, respectively) and 4 years later he entered the business path (30 and 26, respectively).

Receiving successive promotions is the most visible evidence of a manager's potential to assume increasing responsibility for the company's development.³ To investigate whether there are characteristics that increase the likelihood of being promoted to the most exposed positions in an organization, ICAN Research conducted the 'Effective Leadership' project. Interviews with the winners of the Polish edition of the ranking of the most effective presidents of listed companies allowed to distinguish 21 features indicated as the most important in the position of president. In the next step, 300 quantitative interviews among the management staff were conducted.

The features indicated by the participants of the study were very ambiguous. In the quantitative survey conducted among senior management, the most emphasized attributes were passion and commitment to achieving the adopted goals (91%). The second feature in the order of indications (89%) was the constant focus on the expanding knowledge and awareness of one's own limitations. The two least frequently mentioned features were well-balanced hard-hand management (40%), as well as predictability and restraint (63%). Therefore, the study confirms that managing emotions is one of the most difficult skills that people in top positions must acquire.⁴ Presidents participating in the qualitative research also shared their experience in changing employers. In some cases, they indicated that the ability to recognize the moment when they could no longer learn in their work helped significantly in their career development. In a few cases it was a border moment when they decided to look for new challenges and gain experience in other organizations. According to presidents and managing directors, the experience gathered in various companies should be supplemented with additional training. Extensive experience definitely helps in carrying out management tasks. Managing a modern company requires extensive competences and a broad perspective. The ability to properly manage teams is also important.

As part of the Polish project "President's career", the competences of leaders, which are of key importance in identifying development opportunities for an organization, were examined. As a result, it was found that in order to be a good leader, you must not stagnate, you should constantly invest your

³ Zdenko Stacho, Katarina Stachová, Dagmar Cagaňová, J. Blštáková, "The Key Managerial Competencies Tendencies Application in the Business Environment in Slovakia within the Context of Industry 4.0," *EAI Endorsed Transactions on Energy*, Web 8(32), 2021.

⁴ Mateusz Żurawik, "Od menedżera do lidera [RAPORT]", *ICAN Management Review*, ICAN Institute, 2020.

time in your own development. To understand what they really are, you really need to delve into the area and draw conclusions about the added value they bring. In the interviews, the participants of the study claimed that the ability to observe the environment is one of the particularly important competences of people managing modern organizations. Looking outside the company for inspiration to act can help enables identifying business opportunities accurately. The presidents often mentioned networking organizations or industry events as such external sources of inspiration. Investing in education, supplementing knowledge or developing soft skills is very important at all career stages.

As far as the team management is concerned, the surveyed leaders indicated their characteristics, thanks to which their subordinates usually exceed their goals. A key role is setting goals, showing direction and communicating clearly where we are going. If we add an efficient team to this, we are approaching success. However, it is important to be “internally coherent”, that is, to follow the promoted values. The ability to combine hard-handed management with a soft approach to an employee was sometimes indicated as a challenge.

3. THE IDEAL LEADERSHIP

In order to achieve the position of a good leader, you should constantly invest your time in your own development. The results of the research indicated above have shown that one of the first steps is education, including training in soft skills.

The research carried out by ICAN Research has shown that despite the considerable mental burden, people at the top of the corporate hierarchy are relatively good at coping with the challenges that surround them. As part of the “Stress at work” study, susceptibility to stressful situations was compared depending on the position held in the organization. One of the most important conclusions that can be drawn is that managing directors, owners or CEOs of companies deal with criticism and difficult situations at work noticeably better than people at lower levels of the organizational hierarchy. They also reflect on professional failures or other difficult moments relatively less frequently. Promotion to the most important position in the company cannot always be predicted, especially well in advance. ICAN Research respondents often emphasize that at the beginning of their careers they could not imagine themselves as the leader of a large enterprise. Their promotion to the highest positions in companies was definitely helped by gathering experience in

various companies, looking for inspiration in various areas of life, as well as constant investing in the development of their own competences. At the same time, the ability to build effective teams and their subsequent management proved invaluable. Certainly, resistance to stress is also of great importance, which people in the most important positions have to face practically from the moment they are included in the company's succession plans.⁵

Entrepreneurs surveyed by Grant Thornton in 2015 were asked to select three of the fourteen factors they believed to be the most important attributes of a good leader. Most respondents (44%) indicated effective communication. In addition, 38% believed that a business leader should also be creative, and 36% of respondents believe that he should be self-confident and skilfully delegate tasks to subordinates. Only 4% of the survey participants perceive a sense of humor and honesty as the most important attributes of a good leader. The results of the study are slightly different if we relate them to gender. For men, the most important feature is the ability to delegate (50%), and the male part of the surveyed entrepreneurs considered being an inspiration for others (45.5%) as the next most important attribute. For women, the so-called soft skills are more important.⁶

In order to be successful in an increasingly accelerating world, leaders need to pay particular attention to the following three elements:⁷

- joint diagnosis of the situation and creating a vision that should be a response to a given situation,
- effective communication so that people want to act in a situation of permanent change,
- promoting and strengthening flexibility and agility – constant learning and adaptation to the changing reality.

To remain effective under unpredictable conditions, leaders should redefine the acronym

VUCA according to the following model:⁸

- V - the response to Volatility should be Vision;
- U - Ubiquitous Uncertainty should become Understanding;
- C - The response to Complexity should be: Clarity, Cooperation and Courage;
- A - the response to Ambiguity should be Agility and Adaptability.

⁵ Ibid.

⁶ Wojciech Chromik, *Kryzysowy lider #1: Jak być przywódcą w dobie tzw. VUCA?*. <https://poradnikhr.blog/2020/11/20/kryzysowy-lider-1-jak-byc-przywodca-w-dobie-tzw-vuca/> available on 02.03.2022

⁷ Chromik W., op.cit.

⁸ Chromik W., op.cit.

Volatility - this feature of our present day causes in teams the need for constancy on the one hand, and on the other - a quick response to sudden changes in the environment; for a leader, it means the need to provide a clear vision and to launch and most accurately use the talents of his subordinates; if the goals are set together, they will be the right point of reference - this approach supports motivation in the team and helps build its identity, i.e. mobilize it around jointly set goals.

Uncertainty – this feature of our reality creates insecurity in employees, therefore the leader’s task is to search for meaning and explain it; In this case, soft skills are necessary, such as communication (including listening) and care for the proper flow of information, frequent feedback, openness and skillful delegation of tasks; the ability to understand other people’s point of view (i.e. empathy) is also important.

Complexity - this attribute of the present day means, inter alia, data overwhelming; in practice, it causes people to simplify, so the leader’s communication should be simple and precise at the same time; it is the job of a good leader to clearly define rules and modus operandi; any instability or frequent changes of opinion reduce the effectiveness and the level of trust in the leader, hence it is worth focusing on predictability and authenticity.

Ambiguity (ambiguity) – this property of our realities makes planning difficult - not everything is clear, evident; therefore, the leader should take responsibility for adapting to changes and plan only in the short term, and also quickly verify the effects of the actions taken, so as to constantly adapt to dynamic conditions; An effective leader should manage change in such a way as to be able to see opportunities in it instead of threats, and in the case of new situations, use an agile approach, test various solutions to select the most effective ones; In order to win, a good leader should look at the problem from different perspectives and be open to non-standard or new solutions.

According to a survey conducted in 2018 by LinkedIn, as many as 57% of surveyed leaders admitted that soft skills are more important to them than hard skills. Working in a dispersed position, under the constant pressure of the unknown, makes these skills especially important – including the ability to motivate the team, build commitment and a culture of cooperation, and communicate with the team. These competences seem to be so universal that they repeat themselves regardless of the specificity of the industry. Deficiencies in soft skills are usually a big obstacle in building trust and commitment in the team, which results in lower effectiveness.

Soft skills can and should be developed. To do this successfully, there must be done first diagnose the gaps. This is done by examining the current

level of competences and a thorough analysis of the individual's abilities – their strengths and weaknesses. It is necessary to determine what a given person has natural predispositions and where there are deficits, on which he should work harder.⁹

One of the basic skills of a modern leader should be communication developed to a master level. A good leader should be able to listen and understand others, accept criticism with dignity and attention, and articulate his own remarks with respect to employees.

Emotional intelligence deficiencies are also one of the gaps in soft skills. Emotional intelligence, as it is commonly known, consists of: self-awareness, the ability to recognize and manage one's emotions in accordance with the chosen goals, empathy and social skills.

The ability to recognize emotions (including your own emotions) is essential not only when building relationships with the team, but also in the context of market uncertainty. It allows the conscious leader to have a relatively clear view of his own strengths and weaknesses, which allows him to remain confident even in uncertain times.

4. CONCLUSION. MANAGER OF THE FUTURE.

Managing is exercising a managerial function. Leadership is primarily about presenting a specific attitude. A manager usually mobilizes the team to achieve goals and holds accountable for the performance of tasks. The leader, in turn, inspires and inspires to act. An effective manager in a classic approach (ie Management 2.0 vs the latest trend – Management 3.0) sets directions for development and ambitious goals and guides colleagues in this way to achieve them. Builds a team and maximizes its potential so that what is planned is carried out. The leader first of all answers the question “why should we do this” and not “what should we do”. It sets directions, not specific goals.

Building relationships, creating a space for hybrid work, supporting employees in remote work conditions make up tasks for which new types of management will be needed. Among the things that bother us the most in the new, hybrid working conditions, we most often mention technical problems with online connections, the lack of separation between work and private life, and digital fatigue. On the other hand, further difficulties arise from them: decreased involvement, professional burnout, deterioration of well-being.

⁹ Tomasz Wróblewski., Moniki Smulewicz, *Kryzysowy lider. Niezbędnik biznesowego predatora*, GranThornton, 2020.

These types of problems are becoming the problems of management, which still has to face other challenges, such as new tax regulations, an unstable economic environment or a business carried out in the conditions of rapidly rising inflation. Often, questions remain unanswered about what to do so that employees remain committed, so as not to lose the social capital developed over the years, improve communication and effectively motivate.

The role of managers has changed as a result of the pandemic and it should not only be anticipated that this change will stay in offices for longer, but also be prepared for further evolutions in the work culture. In this situation, keeping your finger on the pulse is associated with great commitment and many hours of work. Manfred F. R. Kets de Vries proposes a solution in INSEAD KNOWLEDGE: the appointment of the Chief Social Connectivity Officer (CSCO). The role of CSCO would be to promote interpersonal bonds, a sense of belonging, and, as a result, strengthen the company's social capital. It would also be possible to watch over certain operational activities:¹⁰

- determining which elements of the work would remain in the office and which can be permanently transferred to the Internet;
- protection of personal data in conditions of hybrid work;
- creating a space for hybrid work in the office;
- creating attractive social spaces;
- verifying the fulfillment of the tasks of employees at the home office.

The responsibilities of CSCO would also include many tasks in the field of soft elements of management:

- supporting employees in establishing relationships, deepening ties;
- creating a work-life balance culture;
- developing communication standards;
- counteracting digital fatigue and burnout;
- supporting employees' sense of security.

A wide range of social skills and high emotional intelligence are required of potential CSCOs. As many ways in creating effective solutions will require blazing trails, flexibility and creativity will also come at a cost. Nevertheless, it must not be forgotten that even when CSCO deals with the implementation of appropriate changes in the company, it will not lose importance what soft skills other board members (with the CEO) have or how the change is managed. The cooperation of the CEO and CSCO will be crucial for success.

¹⁰ Marcus Korcz, "Chief Social Connectivity Officer. Nowe stanowisko w hybrydowych biurach", *ICAN Management Review*, ICAN Institute, 2022.

Sažetak:

ZNAČAJKE SUVREMENIH MENADŽERA I VOĐA

Suvremeni svijet postaje sve kompliciraniji i ubrzano se mijenja. Digitalna revolucija i tehnološki napredak radikalno su utjecali na način na koji radimo i uspostavljamo odnose. Uz globalne promjene i stalne društvene i generacijske promjene, mijenjale su se i postojeće poslovne paradigme, a mijenjao se i portret učinkovitog lidera. Tržište danas treba novi model liderskih kompetencija.

Ključne riječi: menadžer, lider, menadžment, Industrija 4.0, VUCA model.

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IMPORTANCE OF JOB QUALITY MANAGEMENT DURING CRISIS

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ABSTRACT

Discussion of the last decades on a good job brings some questions on the elements of the job quality categories. One should understand how industry, government, universities and society define job quality categories. Paper presents the review of a job quality definitions categories and solutions on the job quality improvement.

Key words: job, quality.

1. INTRODUCTION

The concept of work quality is complex, because the work itself is a multi-significant concept, as its scope covers not only the quality of material, organizational and social working conditions, but also the quality of the workplace in terms of technology and the requirements of the employee.¹

¹ Kornelia Polek-Duraj, „*Jakość pracy determinantą jakości życia jednostki (studium przypadku)*”, *Studia Ekonomiczne. Zeszyty Naukowe Uniwersytetu Ekonomicznego w Katowicach*, Nr. pp 309-2017.

In 2001, the Commission of the European Communities formulated a broad approach to the quality of work, which covers both the characteristics of individual tasks and the properties determining the working environment, including the way the labor market functions as a whole. This approach introduces ten dimensions of work quality, which are a practical tool for shaping it:

- internal quality of work,
- skills, lifelong learning, professional development,
- gender equality,
- quality of working conditions,
- flexibility and protection of employment and employment relationships,
- integration and access to the labor market,
- social dialogue and employee involvement,
- work organization and its balance with non-work life,
- diversity and non-discrimination,
- overall performance and efficiency of work.

All of the above criteria are considered when determining the quality of work. They often interpenetrate and are dependent on each other.

The quality of work belongs to the category of relatively often used in economic literature, but it is not understood unequivocally. Some authors reduce the assessment of the quality of an individual contractor's work to the product of work, focusing on its physico-chemical properties or functional characteristics.² In the literature, there is also a view that product quality and work quality are not identical concepts, and in assessing the quality of work, they primarily emphasize the way it is performed, i.e. the manner of conduct or behavior of the person performing the work.³

There is also a view in the literature that the quality of work is determined by its objective difficulty, determining size and structure of the necessary effort and the resulting requirements for the contractor.⁴ In addition to these features of job quality, this category is sometimes also completely subjective, meaning the degree of perceived job satisfaction.⁵

² *Ekonomiczne problemy sterowania jakością*, Warszawa 1980; Romuald Kolman, *Ilościowe określanie jakości*, Warszawa 1973; Andrzej Kostrzewa, *Ekonomiczne podstawy sterowania jakością produkcji*, Warszawa 1974.

³ Wacław Stefan Szubert, Wprowadzenie, w: *Jakość i efektywność pracy*, Studia i Materiały Instytutu Pracy i Spraw Socjalnych, Warszawa z, 17(73), 1977, pp. 5.

⁴ Jan Kordaszewski, *Polityka płac w przemyśle*, Warszawa 1964, pp. 31; Jan Kordaszewski, *Praca i zatrudnienie w przemyśle*, Warszawa 1969, pp. 10.

⁵ Adam Sarapata, *Motywacje a jakość pracy*, [in.]: *Jakość i efektywność pracy*, pp. 25.

The lack of an unequivocal definition of the quality of work can be attributed to the complexity and many aspects of the concept. In view of the above, the aim of the paper is an attempt to analyze the work quality category with emphasis on its components, as well as data analysis aimed at identifying solutions to improve the quality of work.

According to OECD the COVID-19 economic crisis has spotlighted inequities in pay, job protections, working conditions, and sick and paid leave benefits, giving urgency to the notion that more workers particularly those in low-wage jobs and occupations need access to quality jobs.⁶

2. LITERATURE REVIEW ON A JOB QUALITY

There are some studies to create a framework for discussing good jobs and its result were shown in Table 1.

Ogranizing Framework for Elements of Job Quality is based on the review of 11 prominent definitions of job quality from different sources and it groups the different elements that are included in definitions of good jobs into five categories: pay, benefits, working conditions, business culture and job design, and on-the-job skill development.

⁶ OECD, *The impact of the COVID-19 pandemic on jobs and incomes in G20 economies* ILO-OECD paper prepared at the request of G20 Leaders Saudi Arabia's G20 Presidency, 2020

Table 1. Organizing Framework for Elements of Job Quality

	Elements that provide benefits in current job	Elements that support advancement
Pay	Level of pay Predictability of pay	
Benefits	Health insurance Retirement plans Leave Other benefits (disability insurance, etc.)	Educational benefits (tuition assistance, etc.)
Working conditions	Stable, predictable hours Control over hours/location Job security Safety Nondiscrimination	
Business culture and job design	Culture of belonging Culture of diversity, equity, and inclusion Strong organizational mission Meaningfulness of tasks	Focus on personal growth (mentoring, etc.) Autonomy/power to change things Diversity of tasks Clearly defined career paths
On-the-job skill development	Training for specific tasks	Cross-training Advancement training and education

Source: William J. Congdon, Molly M. Scott, Pamela J. Loprest, *How Do We Define “Good Jobs,” and How Do They Affect Worker Well-Being?*, EMPLOYER PRACTICES.

Table 2 presents evidence on Good Jobs Selected findings from the literature relating elements of jobs to worker well-being in the form of results of findings concerning job quality. Elements of that framework may help promote future economic mobility for workers. Presented framework highlights variety of the good job definitions what is connected with some basic categories:

- Job quality definitions are different within their complexity because there are focused only on some elements;
- Salary and working conditions are typical elements in definition of job quality;
- Only some of definitions on job quality include career management elements.

In the literature there are identified five job quality categories that present some research findings:⁷

- Better wages lead to healthier workers. One study demonstrates a link between low earnings and higher mortality, and another shows higher wages are associated with improved physical health.
- Well-designed retirement plans increase retirement wealth.

⁷ William J. Congdon, Molly M. Scott, Pamela J. Loprest, *How Do We Define “Good Jobs”, and How Do They Affect Worker Well-Being?*, Employer practices, February 12, 2021

- Paid family leave is associated with improved maternal mental health and better long-term outcomes for children.
- Unpredictable schedules are associated with psychological distress. Some workers are willing to accept jobs with reduced wages to avoid schedules set on short notice.
- Workers find jobs with greater autonomy to be more meaningful. Workers with autonomy in their jobs report higher levels of psychological well-being.
- Employer-provided training increases wages.

Table 2. Evidence on Good Jobs Selected findings from the literature relating elements of jobs to worker well-being

Job element	Study	Finding
Pay		
Pay level	Kahneman and Deaton (2010)	Positive effect of income on life satisfaction
	Sullivan and von Wachter (2009)	Lower earnings linked with higher mortality
Relative pay	Dube, Giuliano, and Leonard (2019)	Increases in peer wages lead workers to quit
Benefits		
Health insurance	Garthwaite, Gross, and Notowidigdo (2014)	Some low-wage workers take work to obtain access to health insurance
Retirement plans	Thaler and Benartzi (2004)	Well-designed employer-based retirement savings plans increase retirement wealth
Leave	Bullinger (2019)	Paid family leave is associated with better maternal mental health
	DeRigne, Stoddard-Dare, and Quinn (2017)	Paid sick leave is associated with better access to preventive health care
Education benefits	Flaherty (2007)	Tuition reimbursement is associated with workers remaining at a job longer
Working conditions		
Adequate hours	Braga, Brown, and McKernan (2019)	Many part-time workers would prefer to work more hours than offered
Stable/predictable schedules	Schneider and Harknett (2019)	Poor schedules are associated with psychological distress
	Mas and Pallais (2017)	Workers are willing to accept reduced wages to avoid unpredictable schedules
Control over hours/location	Moen et al. (2016)	Flexible working hours improve job satisfaction and may reduce stress
Job security	Wiswall and Zafar (2018)	Workers are willing to accept lower wages for lower chances of dismissal
Safety	Viscusi and Aldy (2003)	Less safe jobs pay workers higher wages
Business culture and job design		
Mission	Hedblom, Hickman, and List (2019)	Jobs with social impact attract more applicants
Autonomy	Bryce (2018)	Work with characteristics associated with greater autonomy is found more meaningful
On-the-job skill development		
Training	Parent (1999)	Employer-provided training raises wages

Source: William J. Congdon, Molly M. Scott, Pamela J. Loprest, *How Do We Define “Good Jobs,” and How Do They Affect Worker Well-Being?*, EMPLOYER PRACTICES

Wages and working conditions appeared in all definitions and training and business culture and job design had the fewest mentions with 5 and 4, respectively.

According to the industry, business size, job function, and employee demographics, there is also presented a flexible definition of the quality job, that provides at least three of the following elements:⁸

- **A living wage** sufficient to support a decent standard of living – or, at minimum, exceeds the median wage offered within the employer’s industry.
- **Basic benefits** that increase economic security, improve health, and promote work-life balance among workers. These include paid leave, health insurance, and a retirement savings plan.
- **Career-building opportunities** that help employees develop the skills, networks, and experiences necessary to launch a career or advance along a career path. These opportunities can include training and mentorship – both formal and informal — and avenues for advancement within the company.
- **Wealth-building opportunities** that enable and incentivize an employee to build the assets they need to manage financial emergencies and achieve long-term financial security for themselves and their families.
- **A fair and engaging workplace** that balances the priorities and wellbeing of employees with the needs of the business. Examples include offering flexible and predictable schedules, treating all staff with respect and dignity, actively soliciting employees’ ideas to improve the business, and helping staff understand how their work contributes to the business’s success.

According to EUROFUND a job quality complements measures of job quantity to provide an assessment of employment strategy. Job quality is a multidimensional concept where different policy agenda and disciplines emphasise different dimensions. In Eurofound’s research, job quality is measured at the level of the job. It includes job features captured from an objective perspective, which can be observed and are related to meeting people’s needs from work. It is made up of all the characteristics of work and employment that have been proven to have a causal relationship with health and well-being. Positive and negative features of the jobs are included. These indicators reflect the job resources (physical, psychological, social or organisational as-

⁸ Daniel Brett, Tom Woelfel, *Defining and Measuring the Creation of Quality Jobs, Moving Beyond Job Creation*, 2016.

pects) and job demands, or the processes that influence them. Eurofound developed seven indices representing different dimensions of job quality, based on aspects of work that have an independent influence on health and well-being. These are: physical environment, work intensity, working time quality, social environment, skills and discretion, prospects, earnings.⁹

Establishing a common understanding of the characteristics of a quality job is central to any effort to promote the creation of quality jobs. One of the major barriers preventing small business owners from offering quality jobs is a widespread belief that doing so will negatively impact their bottom line. While an in-depth exploration of the “business case” for quality jobs is beyond the scope of this report, readers are encouraged to consult the notable, growing body of research devoted to the positive correlation between job quality and profitability.¹⁰

A quality job provides basic benefits that increase workers’ economic security, improve health, and promote work-life balance. Benefits are especially important to low-wage workers who are more vulnerable to the negative effects of ill health or other unexpected life events, yet are less likely to have access to employee benefits than higher income individuals. Responses from interviewees and reviews of the relevant literature revealed three types of benefits that are most important to workers: A) paid leave, B) health insurance, and C) a retirement savings plan. These are also important to employers’ retention and recruitment strategies.¹¹

Building on findings from literature review on job quality, interviewees consistently cited training and mentorship as essential components of a quality job. Training can be either formal or informal, and may be provided by company staff or by third-party workforce development programs or educational institutions. Formal training can include annual training programs or workshops; tuition-assistance; or time off during work hours for staff to acquire relevant credentials, such as educational degrees, industry-recognized certifications, or other certificates of skill development. Informal training and mentorship, while harder to define, is also a key characteristic of job quality, especially because many small businesses may not have capacity to offer formal training to their staff. Informal training and mentorship include support provided to staff in addition to the training provided during the onboarding

⁹ *Job quality*, EUROFUND 11 January 2021.

¹⁰ <http://www.shrm.org/Research/SurveyFindings/Articles/Documents/2015-Employee-Benefits.pdf>

¹¹ Glorian Sorensen, Jack T. Dennerlein, Susan E. Peters, Erika L. Sabbath, Erin L. Kelly, Gregory R. Wagner, “The future of research on work, safety, health and wellbeing: A guiding conceptual framework”, *Social Science & Medicine*, Vol. 269, 2021.

process, and which enable es staff to develop skills and expertise beyond what is required to perform their jobs.¹²

The OECD framework for measuring and assessing job quality considers three objective and measurable dimensions of job quality that are both important for worker well-being and relevant for policy:¹³

- Earnings quality refers to the extent to which the earnings received by workers in their jobs contribute to their well-being. While the level of earnings provides a key benchmark for assessing their contribution to material living standards, the way earnings are distributed across the workforce also matters for well-being. Therefore, the OECD measures earnings quality by an index that accounts for both the level of earnings and their distribution across the workforce (Figure 1).
- Labour market security captures those aspects of economic security that are related to the probability of job loss and its economic cost for workers. This is measured by the risk of unemployment which encompasses both the risk of becoming unemployed and the expected duration of unemployment. It is measured by the degree of public unemployment insurance, which takes into account both the coverage of the benefits and their generosity (Figure 2).
- Quality of the working environment captures non-economic aspects of job quality and includes factors that relate to the nature and content of work performed, working-time arrangements and workplace relationships. Jobs that are characterised by a high level of job demands such as time pressure or physical health risk factors, combined with insufficient job resources to accomplish the required job duties, such as work autonomy and social support at work, constitute a major health risk factor for workers. Therefore, the quality of the working environment is measured by the incidence of job strain, which is a combination of high job demands and limited job resources (Figure 3).

¹² Debra L. Truitt, *The Effect of Training and Development on Employee Attitude as it Relates to Training and Work Proficiency*, SAGE Open 1–13 © The Author(s) 2011.

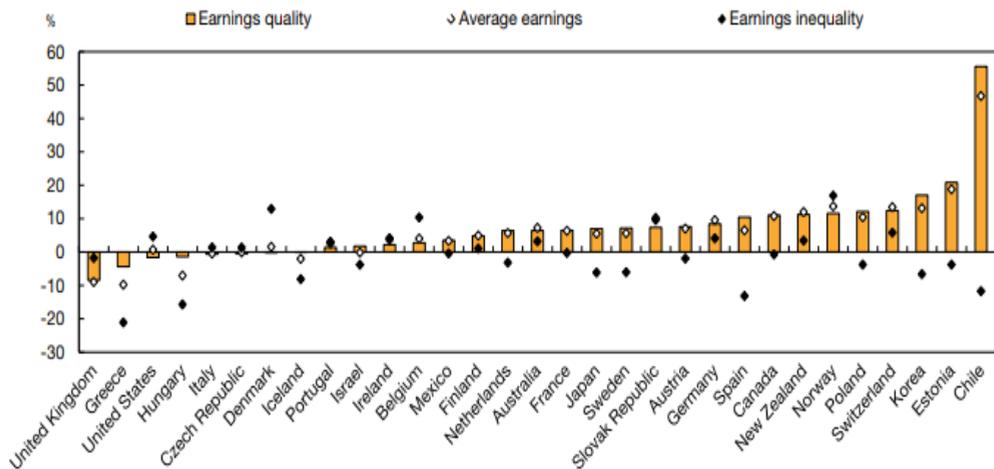
¹³ *How good is your job? Measuring and assessing job quality*, Labour and Social Affairs and the OECD Statistics Directorate, 2016.

3. JOB QUALITY AND WORKPLACE PRACTICES

Job quality over the recent crisis and recovery shown as a deep and often prolonged economic crisis that has taken a toll on the labour markets of most OECD countries, with often dramatic increases in unemployment and its duration. The crisis has also affected those who remained in employment, changing remarkably the quality of existing jobs. Overall, the evidence suggests:¹⁴

1. Earnings quality was heavily affected by the fact that the jobs lost during the crisis were predominantly low-paid. This led to an apparent increase in earnings quality on average what was presented in Figure 1. However, if one keeps the employment structure constant, two thirds of the countries experienced a deterioration of the earning quality.

Figure 1. Changes in earnings quality. Percentage change, 2007-2013

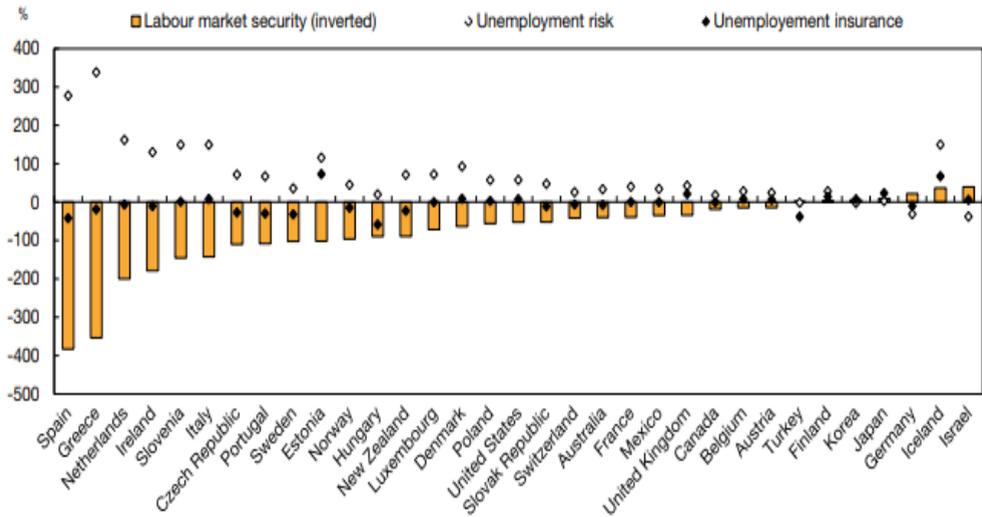


Note. The data refer to changes between: 2006 and 2012 for Italy and Switzerland; 2006 and 2013 for Chile; 2008 and 2013 for Denmark; 2007 and 2012 for France, Poland, Spain and Sweden; 2006 and 2010 for Estonia and the Netherlands; and 2008 and 2011 for Israel. Earnings quality and average earnings in real USD; Source: OECD Job Quality database (2016).

¹⁴ OECD, *How good is your job? Measuring and assessing job quality*, 2016.

2. Labour market security worsened in most OECD, reflecting the combination of a substantially higher risk of unemployment with lower unemployment insurance. The fall was most noticeable in Spain and Greece.

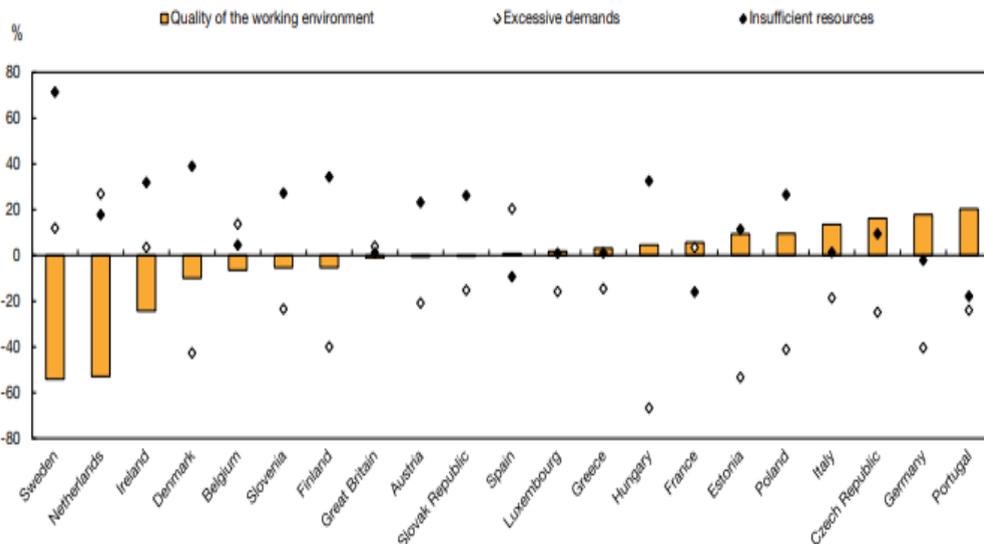
Figure 2. Changes in labour market security Percentage change, 2007-2013



Source: OECD Job Quality database (2016).

3. Quality of the working environment changed differently across the OECD. While some countries experienced a worsening in working conditions as a result of the crisis, in some other countries workers who managed to keep their job saw their working conditions improve.

Figure 3. Changes in the quality of the working environment Percentage change, 2005-2015



Source: OECD Job Quality database (2016), based on the 4th European Working Conditions Survey for 2005 and the 6th European Working Conditions Survey (Forthcoming) for 2015.

For a comprehensive assessment of how the crisis affected job quality, all three dimensions need to be considered jointly. Germany, for instance, not only experienced an increase in the employment rates, but also an improvement in all aspects of job quality. On the contrary, Greece experienced both a sharp rise in unemployment and a fall in earnings quality and labour market security (while the incidence of job strain remained stable). In the United Kingdom, where employment after the initial dip in the early years of the crisis is now almost back to pre-crisis levels, earnings quality decreased over the period but labour market security fell only slightly, while the quality of the working environment was unaffected.

The six sub-indices of the JQI are chosen to reflect the issues that affect workers' perception of whether or not they hold a 'good job'. Issues relating to the social insurance and welfare systems, and also quantitative indicators of labour market performance (such as employment rates) were not included. This reflects a deliberate choice to focus the JQI on the employment relationship itself (in contrast to the Laeken indicators, for example). On the other hand, data limitations inevitably curtailed the choice of sub-indices and the

indicators therein, even though their inclusion would have been desirable.¹⁵

Working time is an important element in job quality. Excessive working hours and, generally, most forms of atypical work have been singled out as having particularly adverse impacts on job quality and workers' health. Work-life balance, depicting the degree to which paid employment is able to be combined with outside-work activities, including care work, is also commonly identified as an important component of job quality.¹⁶

The working-time and work-life balance sub-index is composed of the share of employees working more than 48 hours a week and the average of the percentage of workers on shift work, week-end work, evening work and night work (both are inverted), as well as the share of part-time workers who did not want a full-time job and those workers who say that their working hours fit in well – or very well – with family/social commitments. The working conditions and job security sub-index is a complex composite of a large number of individual indicators relating to work intensity, physical working conditions (noise, bodily strain, etc.) and autonomy at work, along with the subjective perception of likelihood of losing the job in the next six months. Skills and career development is an important aspect of job quality in that it helps workers to advance in their career and thereby avoid dead-end jobs. It is captured by the share of the adult population having participated in education/training over the four weeks prior to the survey.¹⁷

4. EUROPEAN CONTEXT OF THE JOB QUALITY

According to Eurofound and OECD, job quality and its improvement is an important policy concern, as quality jobs are crucial for higher labour force participation, higher well-being and increased economic performance. Job quality is also a key component in making work sustainable and enabling workers to remain motivated to remain in work for longer. It is central to the ILO's Decent Work Agenda, the OECD's jobs strategy and to the European Union's quality of work policies to create more and better jobs. For workers, for the enterprises and organisations that employ them and for societies, there are benefits associated with high-quality jobs, and costs associated with poor-quality jobs.

¹⁵ Janine Leschke, Andrew Watt, Mairé Finn, "Job quality in the crisis – an update of the Job Quality Index (JQI)", *Working Paper*, European Trade Union Institute, 2012.

¹⁶ Sonja Drobnic, Ana M. Guillén, (eds), *Work-life balance in Europe: the role of job quality*, New York, Palgrave Macmillan, 2011.

¹⁷ Janine Leschke, Andrew Watt, Mairé Finn, "Putting a number on job quality? Constructing a European Job Quality Index", *Working Paper* 2008.03, Brussels: ETUI.

The European employment strategy (EES) dates back to 1997, when the EU Member States undertook to establish a set of common objectives and targets for employment policy. Its main aim is the creation of more and better jobs throughout the EU. It now constitutes part of the Europe 2020 growth strategy and it is implemented through the European semester, an annual process promoting close policy coordination among EU Member States and EU Institutions. In particular, the implementation of the EES – supported by the work of the Employment committee – involves the following four steps of the European Semester:¹⁸

Employment guidelines are common priorities and targets for employment policies proposed by the Commission, agreed by national governments and adopted by the EU Council. They are also intrinsically linked with the guidelines for the economic policies of the Member States and of the EU. Together they form the integrated guidelines which, since 2010, underpin the Europe 2020 Strategy for smart, sustainable and inclusive growth. The integrated guidelines reflect the new approach to economic policy-making built on investment, structural reform and fiscal responsibility. The 4 Employment guidelines target four key domains and are structured as follows:

1. Boosting demand for labour, and in particular guidance on job creation, labour taxation and wage-setting.
2. Enhanced labour and skills supply, by addressing structural weaknesses in education and training systems, and by tackling youth and long-term unemployment.
3. Better functioning of the labour markets, with a specific focus on reducing labour market segmentation and improving active labour market measures and labour market mobility.
4. Fairness, combating poverty and promoting equal opportunities for all.

The European Company Survey (ECS) looks at workplace practices with regard to work organisation, human resource management and direct and indirect employee participation.

These workplace practices are key determinants of the job quality of employees. The ECS 2019 examines job autonomy and complexity, the prevalence of part-time work and permanent contracts, the expectations management has of employees, the motivational drivers that are in place, the training and learning opportunities that are offered to employees, as well as the channels for, and impact of, direct and indirect employee participation. Both the ECS 2013 and the ECS 2019 show that establishments that have workplace

¹⁸ European Commission, *European employment strategy – Employment guidelines*, 2020.

practices that ensure good job quality also do better in terms of performance and workplace well-being.

According to research “How good company practices impact on workplace well-being and performance” confirms that most EU27 companies have a positive work climate. ‘High investment, high involvement’ workplaces have the best outcomes for workers and employers, managing to boost performance and improve job quality by:¹⁹

- Increasing employee autonomy (Many jobs across EU27 Only one-fifth of European companies find secret to combining optimal workplace well-being and business performance 7 companies offer little autonomy and only to a small proportion of workers).
- Facilitating employee involvement (Workplaces with involving, trusting and influential social dialogue are more likely to have regular, direct employee participation that makes a difference on the ground),
- Promoting training and learning (Most workplaces in the EU offer at least some training to at least some workers. only 9% of workplaces offer comprehensive training,
- and learning opportunities).

Governments and social partners have a crucial role in promoting good company practices and supporting managers to adopt them in the workplace.

The measures released today in a new database on job quality (key findings) look at the individual experience of people at work. Rather than concentrating on the drivers of job quality such as compliance with standards and regulations, the OECD focuses on the outcomes for workers in three broad areas that are most important for their well-being:²⁰

- Earnings quality. How does employment contribute to material living conditions? How are earnings distributed across the workforce?
- Labour market security. What is the level of risk of becoming and staying unemployed? What are the economic consequences for workers of being laid off?
- The quality of the working environment. Having a job is not just about money. What is the nature and content of the work? How much pressure does it involve? Working-time arrangements, work-

¹⁹ Cedefop, Eurofound, Gijs van Houten, Giovanni Russo, *European company survey 2019: workplace practices unlocking employee potential*, Publications Office, 2020.

²⁰ Colette Fagan, Helen Norman, Smith, Maria González Menéndez, “In search of good quality part-time employment”, *Conditions of Work and Employment Series No. 43*, International Labour Office, Geneva, 2014.

place relationships, opportunities for training and work-life balance are also important factors.

5. CONCLUSION

European policies and action level supports job quality and it includes national authorities and social partners withing companies. Industry can boost performance while improving job quality by bundling practices that increase employee autonomy, facilitate employee voice and promote training and learning. Job quality can be improved by reducing excessive demands on workers and limiting their exposure to risks – and also by increasing their access to work resources that help in achieving work goals or mitigate the effects of these demands.

Each dimension of job quality can also be improved through workplace practices and policies. Workers and employers and their organisations each have a role to play in improving job quality; social dialogue is critical for devising policies in the workplace and beyond. Public authorities should regulate with the common goal of improving job quality in mind.

As some employment statuses are linked to poorer quality jobs, labour market policies aimed at addressing global economic competitiveness and combating high unemployment rates hence need to consider the potential effects for job quality. A high degree of employee involvement creates work environments that are highly motivational and that emphasise skill development, representing an important step towards better job quality.

The development of workers' skills is hampered by unequal access to and uptake of employer-paid training. Older workers participate less in training, and there is a growing gap in access between employees with different contractual statuses (full-time versus part-time and permanent versus fixed-term contracts). Persisting gender segregation in the labour market is reflected in differences in job quality between men and women. But there is no overall winner. Gender gaps can also be to the detriment of men, for example regarding the physical environment. While career prospects have generally improved for men and women, men have maintained their advantage in this dimension of job quality. The unequal sharing of care responsibilities, manifested in longer career breaks and different working time arrangements for women, are the likely cause.²¹

²¹ Based on Eurofound, *Working conditions and sustainable work: An analysis using the job quality framework, Challenges and prospects in the EU series*, Publications Office of the European Union, Luxembourg, 2021.

Sažetak:

VAŽNOST UPRAVLJANJA KVALITETOM RADA ZA VRIJEME KRIZE

Rasprava posljednjih desetljeća o dobrom poslu donosi neka pitanja o elementima kategorija kvalitete rada. Treba razumjeti kako industrija, vlada, sveučilišta i društvo definiraju kategorije kvalitete rada. Članak predstavlja pregled kategorija definicija kvalitete poslova i rješenja za poboljšanje kvalitete rada.

Treba razumjeti kako industrija, vlada, sveučilišta i društvo definiraju kategorije kvalitete posla.

Ključne riječi: posao, kvaliteta.

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ANALIZA STAVOVA O MJERAMA KOJE BI MOGLE POVEĆATI KONKURENTNOST HRVATSKOG GOSPODARSTVA

ANALYSIS OF ATTITUDES TOWARDS MEASURES
WHICH COULD INCREASE COMPETITIVENESS
OF THE CROATIAN ECONOMY

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SAŽETAK

Zbog prekomjerne makroekonomske neravnoteže, Europska je komisija (EK) 2014. godine odredila skup ekonomskih pokazatelja koje je pratila. Primjerice, jedan od njih se odnosio na nisku razinu prihoda od izvoza, osobito robnog. Nadalje, prućena je i konkurentnost hrvatskog gospodarstva. Predmet istraživanja u ovom su radu stavovi izvoznika iz hrvatske regije Sjever. Cilj istraživanja je otkriti postoje li razlike u stavovima o državnim mjerama koje bi mogle povećati hrvatsku konkurentnost izvoznika iz hrvatske regije Sjever u odnosu na izvoznike iz svih hrvatskih županija. Istraživane državne mjere se odnose na poticanje izvoznika za ulaganja u istraživanje i inovacije te digitalizaciju kako bi se unaprijedila kvaliteta njihova poslovanja što bi rezultiralo povećanjem hrvatske konkurentnosti. Nadalje, drugi je cilj istraživanja opisati jačine utjecaja izvoznika iz Kopriivničko-križevačke županije na stavove o važnosti, svih šest analiziranih državnih mjera koje bi mogle povećati hrvatsku gospodarsku konkurentnost. Zaključci istraživanja su da ne postoji statistički značajna razlika u stavovima izvoznika iz regije Sjever u odnosu na izvoznika svih

hrvatskih županija o državnim mjerama koje bi mogle povećati hrvatsku gospodarsku konkurentnost uzme li se u obzir stroži kriterij statističke značajnosti. Nadalje, za tri od šest istraživanih državnih mjera koje bi mogle povećati hrvatsku gospodarsku konkurentnost izvoznici iz Koprivničko-križevačke županije imaju stav da te mjere za njih imaju nisku razinu prioriteta, a za tri da te mjere imaju visoku razinu prioriteta.

Ključne riječi: kvaliteta, državne mjere, ulaganja u unaprjeđivanje kvalitete, konkurentnost hrvatskog gospodarstva, stavovi izvoznika, Koprivničko-križevačka županija.

1. UVOD

U izvještaju Europske komisije (EK) iz 2015. godine: “Makroekonomske neravnoteže – Hrvatska 2014.” je ukazano na prekomjernu makroekonomsku neravnotežu Hrvatske. Eksplicitno je istaknuta niska razina izvoznih, osobito robnih prihoda. Iz tog je razloga određeno posebno praćenje Hrvatske¹. U sažetku dokumenta “Izvješće za Hrvatsku 2015. s detaljnim preispitivanjem o sprječavanju i ispravljanju makroekonomskih neravnoteža”, EK je istaknula nisku razinu vanjske konkurentnosti hrvatskoga gospodarstva zbog koje su prihodi od hrvatskoga izvoza premali što rezultira prekomjernom makroekonomskom neravnotežom².

U izvješću EK iz 2019. godine navedeno je da je Hrvatska prema preporukama iz izvještaja iz prethodnih godina u nekim područjima ostvarila unaprjeđenja, ali da i dalje postoje područja u kojima unaprjeđenja nisu ili su tek djelomično ostvarena. Od kada se u Hrvatskoj prate podaci o makroekonomskoj neravnoteži, od 2014. godine, uspješno je provedeno 51% svih Hrvatskoj upućenih preporuka. Uspješno provedene preporuke se odnose na napredak koji je EK vrednovala “značajnim” i “određenim”. Za preostalih

¹ Makroekonomska neravnoteža – Hrvatska 2014, Europska komisija, 2014, str. 4: http://ec.europa.eu/economy_finance/publications/occasional_paper/2014/pdf/swd_179.pdf, preuzeto 21.5.2021.

² *Izvješće za Hrvatsku 2015*, Europska komisija, 2015, str 1: <https://razvoj.gov.hr/UserDocsImages//O%20ministarstvu/Europski%20semestar/Izvje%C5%A1%C4%87e%20za%20Hrvatsku%202015.%20S%20detaljnim%20preispitivanjem%20o%20sprje%C4%8Davanju%20i%20ispravljanju%20makroekonomskih%20neravnote%C5%BEa.pdf>, preuzeto 21.5.2021.

49% preporuka koje su tijekom godina bile upućivane Hrvatskoj, napredak je vrednovan atributima “ograničen” ili ga uopće nije bilo³.

U zaključcima izvještaja konstatirano je da Hrvatska više nema prekomjernu makroekonomsku neravnotežu nego “samo” makroekonomsku neravnotežu⁴. Na temelju prethodno predstavljenih podataka, jasno je da Hrvatska i dalje treba poduzimati reforme koje bi rezultirale nepostojanjem makroekonomske neravnoteže. Najbolji način kako smanjiti makroekonomsku neravnotežu u Hrvatskoj je povećati izvozne prihode. Jedan od najvažnijih uvjeta da Hrvatska poveća izvoz, osobito robni, je povećanje konkurentnosti hrvatskog gospodarstva.

1.1. Problem i predmet istraživanja

U istraživanju kojeg je provodio za potrebe izrade doktorskog rada, Marić⁵ je između ostalih istraživao i stavove izvoznika iz svih županija Republike Hrvatske o šest državnih mjera koje bi, prema njegovom mišljenju, trebale rezultirati povećanjem hrvatske gospodarske konkurentnosti. Izvoznici su se o važnosti promatranih državnih mjera, odnosno o razini prioriteta izjašnjavali korištenjem Likertove ljestvice s pet razina prioriteta tako da je numerička vrijednost 1 odgovarala razini prioriteta *Iznimno važan*, a numerička vrijednost 5 razini prioriteta *Potpuno nevažan*. Analizom aritmetičkih sredina stavova izvoznika, utvrđeno je da postoji statistički značajna varijabilnost u stavovima izvoznika između i unutar uzoraka pri čemu uzorak predstavljaju odgovori ispitanika na jedno anketno pitanje. To znači da su izvoznici različito vrednovali važnosti, odnosno prioritete istraživanih državnih mjera za povećanje konkurentnosti hrvatskog gospodarstva. Neke od istraživanih mjera su izvoznici vrednovali važnijim od ostalih. Popis državnih mjera koje bi mogle povećati hrvatsku gospodarsku konkurentnost, u poretku od najvažnije prema manje važnim, su:

- “Rasterećenje poslovnog sektora od prekomjernih troškova regulative, administracije i nameta;
- Digitalizacija gospodarstva i industrije;

³ 2019 european semester country report croatia, Europska komisija, 2019: https://ec.europa.eu/info/sites/info/files/file_import/2019-european-semester-country-report-croatia_hr.pdf, preuzeto 21.5.2021.

⁴ Isto, str. 18.

⁵ Kristijan Marić, *Modeli za podizanje izvozne konkurentnosti hrvatskoga gospodarstva*, doktorska disertacija, Digitalni repozitorij ocjenskih radova Sveučilišta u Zadru, 2019: <https://repozitorij.unizd.hr/islandora/object/unizd%3A3416/datastream/PDF/view>. preuzeto 18.5.2021.

- Poticanje ulaganja u istraživanje i inovacije te razvoj poduzetništva putem EU programa i ostalih javnih sredstava;
- Razvoj sustava akreditacija i sporazuma za osiguravanje međunarodno prihvaćenih certifikata, izvještaja o ispitivanju i inspekciji;
- Umrežavanje izvoznika u zajedničkom nastupu u formalnim klasterima te poticanje na međusobno pomaganje i razmjenu iskustva u inozemstvu;
- Podrška u izvansudskom rješavanju prekograničnih problema i administrativnih prepreka EU⁶.

U ovom se istraživanju problematizira postoji li razlika u stavovima o razini prioriteta državnih mjera koje bi povećale hrvatsku gospodarsku konkurentnost u nekim skupinama izvoznika. Općenito, u društvenim se istraživanjima koja se odnose na stavove istraživani podaci često stratificiraju kako bi se smanjila varijabilnost stavova, odnosno kako bi se izveli relevantniji zaključci.

Istraživani podaci su stratificirani prema teritorijalnom načelu. Djelatnosti poslovanja, pa i problemi koji iz njih proizlaze, gospodarskim su subjektima u nekoj regiji sličniji u odnosu na gospodarske subjekte iz drugih regija. Iz tog se razloga može očekivati manja varijabilnost u stavovima na stratificiranom uzorku u odnosu na uzorak podataka koji obuhvaća izvoznike iz cijele Hrvatske. Predmet istraživanja su stavovi hrvatskih izvoznika iz regije Sjever, koja obuhvaća Krapinsko-zagorsku, Varaždinsku, Međimursku i Koprivničko-križevačku županiju o razini prioriteta državnih mjera koje bi povećale gospodarsku konkurentnost.

1.2. Ciljevi istraživanja

Cilj istraživanja je otkriti postoje li razlike u stavovima izvoznika iz regije Sjever u odnosu na izvoznike iz svih županija Hrvatske o važnosti, odnosno razini prioriteta, državnih mjera koje bi povećale gospodarsku konkurentnost. Ako razlike u stavovima hrvatskih izvoznika iz regije Sjever u odnosu na izvoznike iz svih regija Hrvatske ne postoje ta bi činjenica povećala relevantnost istraživanja Marića. Naime, veličina istraživanog uzorka podataka nije dovoljno reprezentativna jer je obuhvaćala stavove 133 ispitanika iz cijele Hrvatske. Ako statistički značajna razlika u stavovima svih i ispitanika iz stratificirane skupine, u kojoj se očekuje manja varijabilnost stavova, ne postoji zaključci istraživanja Marića se mogu smatrati potvrđenima. U tom bi slučaju, na temelju rezultata ovog istraživanja hrvatski izvoznici raspola-

⁶ Ibid.

li dopunskim argumentima u inzistiranju na donošenju državnih mjera koje bi povećale konkurentnost hrvatskog gospodarstva. Drugi je cilj istraživanja otkriti jačinu utjecaja izvoznika iz Koprivničko-križevačke županije na stavove o važnosti, odnosno razini prioriteta svih šest istraživanih državnih mjera koje bi mogle povećati hrvatsku gospodarsku konkurentnost.

2. ANALIZA I INTERPRETACIJA REZULTATA ISTRAŽIVANJA

Za potrebe ostvarivanja prvog cilja istraživanja, odnosno otkrivanja postoji li razlika u stavovima izvoznika čije je sjedište u županijama koje pripadaju regiji Sjever, odnosno iz Krapinsko-zagorske, Varaždinske, Međimurske i Koprivničko-križevačke županija u odnosu na stavove izvoznika iz svih hrvatskih županija, prvo su iz svih podataka izdvojeni odgovori izvoznika iz četiri županije koje pripadaju regiji Sjever. U ovom istraživanju analiziraju se stavovi 15 izvoznika iz te regije.

Otkrivanje postoje li razlike u stavovima izvoznika iz regije Sjever u odnosu na stavove svih izvoznika provedeno je ispitivanjem postoji li statistički značajna razlika aritmetičkih sredina stavova izvoznika iz regije Sjever i svih izvoznika. Ta je analiza provedena korištenjem statističke metoda *t-Test*. Njom se utvrđuje postoji li statistički značajna razlika aritmetičkih sredina dva skupa podataka. Skupovi podataka ne trebaju imati jednak broj podataka. Postoje dva oblika *t-Testa* s nejednakim brojem podataka. Jedan koji pretpostavlja da promatrani skupovi imaju statistički različite varijance i drugi koji pretpostavlja da promatrani skupovi nemaju statistički različite varijance. Stoga, prvi korak u analiziranju eventualnih statistički značajnih razlika aritmetičkih sredina zahtijeva analiziranje postoji li statistički značajne razlike varijanci promatranih skupova podataka. Ta se analiza provodi *f-Testom*.

Rezultati analize varijanci odgovora izvoznika iz regije Sjever o važnosti, odnosno razini prioriteta poželjnih državnih mjera odnosno njihovih stavova koje bi povećale gospodarsku konkurentnost na svih šest pitanja, su pokazali da odgovori nemaju statistički različite varijance. Stoga, za svih šest analiza postoje li statistički značajne razlike aritmetičkih sredina korišten je oblik *t-Testa* koji pretpostavlja statistički jednake varijance. Rezultati analize su prikazani i interpretirani u sljedećih šest tablica.

Tablica 1. Analiza razlika aritmetičkih sredina za stav koji se odnosi na važnost rasterećenja poslovnog sektora od prekomjernih troškova regulative

t-Test: Two-Sample Assuming Equal Variances		
Smatram da rasterećenje poslovnog sektora od prekomjernih troškova regulative, administracije i nameta za podizanje konkurentnosti mojeg poduzeća ima razinu prioriteta 1 = Iznimno važan, 2 = Važan, 3 = Podjednako važan i nevažan, 4 = Neznatno važan, 5 = Potpuno nevažan		
	Svi izvoznici	Izvoznici iz regije Sjever
Mean	1,8120	1,8571
Variance	1,0932	1,0549
Observations	133	14
Pooled Variance	1,0898	
Hypothesized Mean	0	
df	145	
t Stat	-0,1538	
P(T<=t) one-tail	0,4390	
t Critical one-tail	1,6554	
P(T<=t) two-tail	0,8780	
t Critical two-tail	1,9765	

Izvor: Obradio autor na temelju podataka iz istraživanja: Kristijan Marić, Modeli za podizanje izvozne konkurentnosti hrvatskoga gospodarstva, doktorska disertacija, Digitalni repozitorij ocjenskih radova Sveučilišta u Zadru, 2019:
<https://repozitorij.unizd.hr/islandora/object/unizd%3A3416/datastream/PDF/view>. preuzeto 18.5.2021.

U tablici 1. prikazane su vrijednosti izračuna provođenja *t-Testa* koji podrazumijeva statistički iste varijance. Tablica sadrži više statističkih parametara, poput srednje vrijednosti za obje skupine podataka, stupnja slobode, vrijednosti *t* i *P*. Vrijednosti *P* se odnose na vjerojatnosti za pogrešno izveden zaključak da postoji statistički značajna razlika aritmetičkih sredina za jednosmjerni i dvosmjerni *t-Test*. Za izvođenje zaključka u ovom istraživanju ključna je vrijednost *P(T<=t) two-tail*. Kako ona iznosi 0,8780, što znači da je veća od granične vrijednosti 0,05 za manje strog kriterij statističke značajnosti razlike aritmetičkih sredina dvaju promatranih skupova podataka, izvodi se zaključak da ne postoji statistički značajna razlika aritmetičkih sredina vrijednosti odgovora, odnosno stavova svih i izvoznika iz regije Sjever

da državna mjera koja se odnosi na rasterećenje od prekomjernih troškova regulative, administracije i nameta. Nadalje, izvodi se i zaključak da svim i izvoznicima iz regije Sjever ta mjera za podizanje konkurentnosti ima važan prioritet. Takav zaključak proizlazi iz činjenice da su obje vrijednosti aritmetičkih sredina odgovora značajno manje od 3, što znači da u odgovorima izvoznika obje promatrane skupine prevladavaju odgovori da im je prioritet te mjere *Iznimno važan* i *Važan*. Izvoznicima iz regije Sjever je neznatno manje važno rasterećenje poslovnih troškova u odnosu na sve izvoznike jer je vrijednost aritmetičke sredina odgovora izvoznika iz regije Sjever neznatno veća u odnosu na vrijednost aritmetičke sredine odgovora svih izvoznika. Manja vrijednost varijance stavova izvoznika iz regije Sjever u odnosu na vrijednost varijance stavova svih izvoznika potvrđuje očekivanu manju varijabilnost stratificiranih podataka, odnosno odgovora izvoznika iz regije Sjever.

Identičan zaključak da ne postoji statistički značajna razlika stavova svih i izvoznika iz Regije Sjever može se izvesti usporedbom vrijednosti varijabli *t Stat* i *t Critical two-tail*. Vrijednost *t Critical two-tail* se odnosi na najmanju vrijednost kada bi postojala statistički značajna razlika aritmetičkih sredina promatranih skupova podataka, odnosno stavova svih i izvoznika iz regije Sjever. U slučajevima kada je apsolutna vrijednost *t Stat* veća od vrijednosti *t Critical two-tail* radi se o statistički značajnoj razlici aritmetičkih sredina promatranih skupova podataka.

Apsolutna vrijednost *t Stat* = 0,1538 u tablici 1. je manja od vrijednosti *t Critical two-tail* = 0,8780 u tablici 1. Na temelju te se činjenice izvodi zaključak da ne postoji statistički značajna razlika vrijednosti aritmetičkih sredina u stavovima svih i izvoznika iz regije Sjever da je državna mjera koja se odnosi na rasterećenje od prekomjernih troškova regulative, administracije i nameta za podizanje konkurentnosti izvoznicima predstavlja važan prioritet jer su obje vrijednosti aritmetičkih sredina manje od 3, što znači da u odgovorima izvoznika obje promatrane skupine prevladavaju odgovori da im je prioritet te mjere *Iznimno važan* i *Važan*.

U tablici 2. prikazane su vrijednosti izračuna provođenja *t-Testa* koji se odnosi na stavove o važnosti poticanja ulaganja u istraživanje i inovacije. Vrijednost $P(T \leq t)$ *two-tail* iznosi 0,8069, što znači da je veća od granične vrijednosti 0,05 za manje strog kriterij statističke značajnosti razlike aritmetičkih sredina dvaju promatranih skupova podataka pa se izvodi zaključak da ne postoji statistički značajna razlika aritmetičkih sredina vrijednosti odgovora, odnosno stavova svih i izvoznika iz regije Sjever da državna mjera koja se odnosi na stav o važnosti poticanja ulaganja u istraživanje i inovacije te razvoj poduzetništva putem EU programa i ostalih javnih sredstava. Nadalje,

izvodi se i zaključak da svima, i izvoznicima iz regije Sjever, ta mjera za podizanje konkurentnosti ima važan prioritet.

Takav zaključak proizlazi iz činjenice da su obje vrijednosti aritmetičkih sredina odgovora značajno manje od 3, što znači da u odgovorima izvoznika obje promatrane skupine prevladavaju odgovori da im je prioritet te mjere *Iznimno važan* i *Važan*. Izvoznicima iz regije Sjever je neznatno više važno da država potiče ulaganja u istraživanje i inovacije te razvoj poduzetništva putem EU programa i ostalih javnih sredstava u odnosu na sve izvoznike jer je vrijednost aritmetičke sredina odgovora izvoznika iz regije Sjever neznatno manja u odnosu na vrijednost aritmetičke sredine odgovora svih izvoznika. Manja vrijednost varijance odgovora izvoznika iz regije Sjever u odnosu na vrijednost varijance odgovora ispitanika potvrđuje očekivanu manju varijabilnost stratificiranih podataka, odnosno odgovora izvoznika iz regije Sjever.

Tablica 2. Analiza razlika aritmetičkih sredina za stav koji se odnosi na važnost poticanja ulaganja u istraživanje i inovacije

t-Test: Two-Sample Assuming Equal Variances		
Smatram da poticanje ulaganja u istraživanje i inovacije te razvoj poduzetništva putem EU programa i ostalih javnih sredstava za podizanje konkurentnosti mojeg poduzeća ima razinu prioriteta: 1 = Iznimno važan, 2 = Važan, 3 = Podjednako važan i nevažan, 4 = Neznatno važan, 5 = Potpuno nevažan		
	Svi izvoznici	Izvoznici iz regije Sjever
Mean	2,0752	2,0000
Variance	1,2367	0,7692
Observations	133	14
Pooled Variance	1,1948	
Hypothesized Mean	0	
df	145	
t Stat	0,2448	
P(T<=t) one-tail	0,4035	
t Critical one-tail	1,6554	
P(T<=t) two-tail	0,8069	
t Critical two-tail	1,9765	

Izvor: Obradio autor na temelju podataka iz istraživanja: Kristijan Marić, *Modeli za podizanje izvozne konkurentnosti hrvatskoga gospodarstva*, doktorska disertacija, Digitalni repozitorij ocjenskih radova Sveučilišta u Zadru, 2019:

<https://repozitorij.unizd.hr/islandora/object/unizd%3A3416/datastream/PDF/view>. preuzeto 18.5.2021.

U tablici 3. prikazane su vrijednosti izračuna provođenja *t-Testa* koji se odnosi na stavove o važnosti umrežavanje izvoznika u zajedničkom nastupu u formalnim klasterima. Vrijednost $P(T \leq t)$ *two-tail* iznosi 0,3894, što znači da je veća od granične vrijednosti 0,05 za manje strog kriterij statističke značajnosti razlike aritmetičkih sredina dvaju promatranih skupova podataka pa se izvodi zaključak da ne postoji statistički značajna razlika aritmetičkih sredina vrijednosti odgovora, odnosno stavova svih i izvoznika iz regije Sjever da je državna mjera koja se odnosi na umrežavanje izvoznika u zajedničkom nastupu u formalnim klasterima te poticanje na međusobno pomaganje i razmjenu iskustava u inozemstvu. Nadalje, izvodi se i zaključak da svim i izvoznicima iz regije Sjever ta mjera za podizanje konkurentnosti ima važan prioritet.

Takav zaključak proizlazi iz činjenice da su obje vrijednosti aritmetičkih sredina odgovora manje od 3, što znači da u odgovorima izvoznika obje promatrane skupine prevladavaju odgovori da im je prioritet te mjere *Iznimno važan* i *Važan*. Izvoznicima iz regije Sjever je manje važno da država potiče umrežavanje izvoznika u zajedničkom nastupu u formalnim klasterima u odnosu na sve izvoznike jer je vrijednost aritmetičke sredina odgovora izvoznika iz regije Sjever neznatno veća u odnosu na vrijednost aritmetičke sredine odgovora svih izvoznika. Manja vrijednost varijance odgovora izvoznika iz regije Sjever u odnosu na vrijednost varijance odgovora ispitanika potvrđuje očekivanu manju varijabilnost stratificiranih podataka, odnosno odgovora izvoznika iz regije Sjever.

Tablica 3. Analiza razlika aritmetičkih sredina za stav koji se odnosi na važnost umrežavanja izvoznika u zajedničkom nastupu u formalnim klasterima

t-Test: Two-Sample Assuming Equal Variances		
Smatram da umrežavanje izvoznika u zajedničkom nastupu u formalnim klasterima te poticanje na međusobno pomaganje i razmjenu iskustava u inozemstvu za podizanje konkurentnosti mojeg poduzeća ima razinu prioriteta: 1 = Iznimno važan, 2 = Važan, 3 = Podjednako važan i nevažan, 4 = Neznatno važan, 5 = Potpuno nevažan		
	Svi izvoznici	Izvoznici iz regije Sjever
Mean	2,5188	2,7857
Variance	1,2364	0,9505
Observations	133	14
Pooled Variance	1,2108	
Hypothesized Mean	0	
df	145	
t Stat	-0,8633	
P(T<=t) one-tail	0,1947	
t Critical one-tail	1,6554	
P(T<=t) two-tail	0,3894	
t Critical two-tail	1,9765	

Izvor: Obradio autor na temelju podataka iz istraživanja: Kristijan Marić, *Modeli za podizanje izvozne konkurentnosti hrvatskoga gospodarstva*, doktorska disertacija, Digitalni repozitorij ocjenskih radova Sveučilišta u Zadru, 2019:
<https://repozitorij.unizd.hr/islandora/object/unizd%3A3416/datastream/PDF/view>. preuzeto 18.5.2021.

U tablici 4. prikazane su vrijednosti izračuna provođenja *t-Testa* koji se odnosi na stavove o važnosti digitalizacije gospodarstva i industrije. Vrijednost $P(T \leq t)$ *two-tail* iznosi 0,0128, što znači da je manja od granične vrijednosti 0,05 za manje strog kriterij statističke značajnosti razlike aritmetičkih sredina dvaju promatranih skupova podataka, ali veća od strožeg kriterija statističke značajnosti razlike aritmetičkih sredina dvaju promatranih skupova podataka koji iznosi 0,01 pa se izvodi zaključak da ne postoji statistički značajna razlika aritmetičkih sredina vrijednosti odgovora, odnosno stavova svih i izvoznika iz regije Sjever da je državna mjera koja se odnosi na digitalizaciju gospodarstva i industrije. Nadalje, izvodi se i zaključak da svim i izvoznicima iz regije Sjever ta mjera za podizanje konkurentnosti ima važan prioritet.

Takav zaključak proizlazi iz činjenice da su obje vrijednosti aritmetičkih sredina odgovora manje od 3, što znači da u odgovorima izvoznika obje promatrane skupine prevladavaju odgovori da im je prioritet te mjere *Iznimno važan* i *Važan*. Izvoznicima iz regije Sjever je manje važno da država potiče digitalizaciju gospodarstva i industrije jer je vrijednost aritmetičke sredina odgovora izvoznika iz regije Sjever veća u odnosu na vrijednost aritmetičke sredine odgovora svih izvoznika. Veća vrijednost varijance odgovora izvoznika iz regije Sjever u odnosu na vrijednost varijance odgovora ispitanika opovrgava očekivanu manju varijabilnost stratificiranih podataka, odnosno odgovora izvoznika iz regije Sjever.

Tablica 4. Analiza razlika aritmetičkih sredina za stav koji se odnosi na važnost digitalizacije gospodarstva i industrije

t-Test: Two-Sample Assuming Equal Variances		
Smatram da digitalizacija gospodarstva i industrije za podizanje konkurentnosti mojeg poduzeća ima razinu prioriteta: 1 = Iznimno važan, 2 = Važan, 3 = Podjednako važan i nevažan, 4 = Neznatno važan, 5 = Potpuno nevažan		
	Svi izvoznici	Izvoznici iz regije Sjever
Mean	1,9398	2,6429
Variance	0,9661	1,1703
Observations	133	14
Pooled Variance	0,9844	
Hypothesized Mean	0	
df	145	
t Stat	-2,5218	
P(T<=t) one-tail	0,0064	
t Critical one-tail	1,6554	
P(T<=t) two-tail	0,0128	
t Critical two-tail	1,9765	

Izvor: Obradio autor na temelju podataka iz istraživanja: Kristijan Marić, *Modeli za podizanje izvozne konkurentnosti hrvatskoga gospodarstva*, doktorska disertacija, Digitalni repozitorij ocjenskih radova Sveučilišta u Zadru, 2019:

<https://repozitorij.unizd.hr/islandora/object/unizd%3A3416/datastream/PDF/view>. preuzeto 18.5.2021

U tablici 5. prikazane su vrijednosti izračuna provođenja *t-Testa* koji se odnosi na stavove o važnosti podrške države u izvansudskom rješavanju pre-

kograničnih problema i administrativnih prepreka EU. Vrijednost $P(T \leq t)$ *two-tail* iznosi 0,1265, što znači da je veća od granične vrijednosti 0,05 za manje strog kriterij statističke značajnosti razlike aritmetičkih sredina dvaju promatranih skupova podataka pa se izvodi zaključak da ne postoji statistički značajna razlika aritmetičkih sredina vrijednosti odgovora, odnosno stavova svih i izvoznika iz regije Sjever da je državna mjera koja se odnosi na podršku u izvansudskom rješavanju prekograničnih problema i administrativnih prepreka EU. Nadalje, izvodi se i zaključak da svim i izvoznicima iz regije Sjever ta mjera za podizanje konkurentnosti ima važan prioritet.

Tablica 5. Analiza razlika aritmetičkih sredina za stav koji se odnosi na važnost podrške države u izvansudskom rješavanju prekograničnih problema

t-Test: Two-Sample Assuming Equal Variances		
Smatram da podrška u izvansudskom rješavanju prekograničnih problema i administrativnih prepreka EU za podizanje konkurentnosti mojeg poduzeća ima razinu prioriteta: 1 = Iznimno važan, 2 = Važan, 3 = Podjednako važan i nevažan, 4 = Neznatno važan, 5 = Potpuno nevažan		
	Svi izvoznici	Izvoznici iz regije Sjever
Mean	2,6015	2,1429
Variance	1,1355	1,0549
Observations	133	14
Pooled Variance	1,1282	
Hypothesized Mean	0	
df	145	
t Stat	1,5368	
P(T<=t) one-tail	0,0633	
t Critical one-tail	1,6554	
P(T<=t) two-tail	0,1265	
t Critical two-tail	1,9765	

Izvor: Obradio autor na temelju podataka iz istraživanja: Kristijan Marić, *Modeli za podizanje izvozne konkurentnosti hrvatskoga gospodarstva*, doktorska disertacija, Digitalni repozitorij ocjenskih radova Sveučilišta u Zadru, 2019: <https://repozitorij.unizd.hr/islandora/object/unizd%3A3416/datastream/PDF/view>. preuzeto 18.5.2021.

Takav zaključak proizlazi iz činjenice da su obje vrijednosti aritmetičkih sredina odgovora manje od 3, što znači da u odgovorima izvoznika obje promatrane skupine prevladavaju odgovori da im je prioritet te mjere *Iznimno važan* i *Važan*. Izvoznicima iz regije Sjever je više važno da država potiče umrežavanje izvoznika u zajedničkom nastupu u formalnim klasterima u odnosu na sve izvoznike jer je vrijednost aritmetičke sredine odgovora izvoznika iz regije Sjever manja u odnosu na vrijednost aritmetičke sredine odgovora svih izvoznika. Manja vrijednost varijance odgovora izvoznika iz regije Sjever u odnosu na vrijednost varijance odgovora ispitanika potvrđuje očekivanu manju varijabilnost odgovora izvoznika iz regije Sjever.

U tablici 6. prikazane su vrijednosti izračuna provođenja t-Testa koji se odnosi na stavove o važnosti razvoja sustava akreditacija i međunarodnih sporazuma. Vrijednost $P(T \leq t)$ *two-tail* iznosi 0,2122, što znači da je veća od granične vrijednosti 0,05 za manje strog kriterij statističke značajnosti razlike aritmetičkih sredina dvaju promatranih skupova podataka pa se izvodi zaključak da ne postoji statistički značajna razlika aritmetičkih sredina vrijednosti odgovora, odnosno stavova svih i izvoznika iz regije Sjever da je državna mjera koja se odnosi na razvoj sustava akreditacija i međunarodnih sporazuma za osiguravanje međunarodno prihvaćenih certifikata, izvještaja o ispitivanju i inspekciji te verifikacija izdanih od strane akreditiranih tijela što omogućuje da se proizvodi ili usluge ne moraju ponovno ocjenjivati u svakoj zemlji gdje se izvezu. Nadalje, izvodi se i zaključak da svim i izvoznicima iz regije Sjever ta mjera za podizanje konkurentnosti ima važan prioritet.

Tablica 6. Analiza razlika aritmetičkih sredina za stav koji se odnosi na važnost razvoja sustava akreditacija i međunarodnih sporazuma

t-Test: Two-Sample Assuming Equal Variances		
<p>Smatram da razvoj sustava akreditacija i međunarodnih sporazuma za osiguravanje međunarodno prihvaćenih certifikata, izvještaja o ispitivanju i inspekciji te verifikacija izdanih od strane akreditiranih tijela što omogućava da se proizvodi ili usluge ne moraju ponovno ocjenjivati u svakoj zemlji gdje se izvezu za podizanje konkurentnosti mojeg poduzeća ima razinu prioriteta: 1 = Iznimno važan, 2 = Važan, 3 = Podjednako važan i nevažan, 4 = Neznatno važan, 5 = Potpuno nevažan</p>		
	Svi izvoznici	Izvoznici iz regije Sjever
Mean	2,1729	1,7857
Variance	1,1896	1,4121
Observations	133	14
Pooled Variance	1,2095	
Hypothesized Mean	0	
df	145	
t Stat	1,2531	
P(T<=t) one-tail	0,1061	
t Critical one-tail	1,6554	
P(T<=t) two-tail	0,2122	
t Critical two-tail	1,9765	

Izvor: Obradio autor na temelju podataka iz istraživanja: Kristijan Marić, *Modeli za podizanje izvozne konkurentnosti hrvatskoga gospodarstva*, doktorska disertacija, Digitalni repozitorij ocjenskih radova Sveučilišta u Zadru, 2019:
<https://repozitorij.unizd.hr/islandora/object/unizd%3A3416/datastream/PDF/view>. preuzeto 18.5.2021.

Takav zaključak proizlazi iz činjenice da su obje vrijednosti aritmetičkih sredina odgovora manje od 3, što znači da u odgovorima izvoznika obje promatrane skupine prevladavaju odgovori da im je prioritet te mjere *Iznimno važan* i *Važan*. Izvoznicima iz regije Sjever je manje važno da država razvije sustava akreditacija i međunarodnih sporazuma u odnosu na sve izvoznike jer je vrijednost aritmetičke sredina odgovora izvoznika iz regije Sjever veća u odnosu na vrijednost aritmetičke sredine odgovora svih izvoznika. Veća vrijednost varijance odgovora izvoznika iz regije Sjever u odnosu na vrijed-

nost varijance odgovora ispitanika opovrgava očekivanu manju varijabilnost odgovora izvoznika iz regije Sjever.

Drugi se cilj istraživanja odnosi na otkrivanje jačine utjecaja izvoznika iz Koprivničko-križevačke županije na stavove da svih šest državnih mjera koje bi mogle povećati hrvatsku gospodarsku konkurentnost izvoznicima predstavljaju visoku razinu prioriteta. Vrijednosti jačine utjecaja na svaki stav o visokoj razini prioriteta analizirane mjere koje bi mogle rezultirati povećanjem konkurentnosti izračunavane su korištenjem metode *Težina dokaza* (engl. *Weight of Evidence*). Ta se metoda koristi za izračunavanje vrijednosti jačine utjecaja svake zastupljene varijable iz analiziranog uzorka na prethodno određene ciljne varijable.

U ovom istraživanju ciljne varijable mogu imati dvije vrijednosti. Prva se odnosi na stav izvoznika da smatraju da analizirana državna mjera za njih ima visoku razinu prioriteta, a druga se vrijednost odnosi na stav izvoznika da smatraju da analizirana državna mjera za njih nema visoku razinu prioriteta. Stoga, odgovori izvoznika na svih šest analiziranih anketnih pitanja su prvo transformirani tako da su vrijednosti odgovora 1 = *Iznimno važan*, 2 = *Važan* promijenjene u vrijednost da analizirana državna mjera *ima visoki prioritet*, a vrijednosti odgovora 3 = *Podjednako važan i nevažan*, 4 = *Neznatno važan* i 5 = *Potpuno nevažan* da analizirana državna mjera *nema visoki prioritet*. Vrijednost jačine utjecaja izvoznika razdijeljenih prema županijama sjedišta na ciljnu varijablu, odnosno stav da analizirana državna mjera za njih ima ili nema visoki prioritet se izračunava prema formuli $WoE = \ln(D_{nc}/D_c)$. To znači da vrijednost jačine utjecaja izvoznika iz svake hrvatske županije na određene ciljne varijable predstavlja prirodni logaritam omjera postotaka između stava da im državna mjera ima visoki prioritet i stava da ga nema⁷.

⁷ Vijayan Sugumaran, Arun Kumar Sangaiah, Arunkumar Thangavelu, „Computational Intelligence Applications in Business Intelligence and Big Data Analytics”, 2017, str. 141-147.

Tablica 7. Vrijednosti jačine utjecaja za stav koji se odnosi na važnost rasterećenja poslovnog sektora od prekomjernih troškova regulative prema sjedištu izvoznika

Vrijednost varijable <i>Težina dokaza</i>	Županija sjedišta
0,1947	Grad Zagreb
0,1000	Bjelovarsko-bilogorska
0,1000	Brodsko-posavska
0,1000	Istarska
0,1000	Karlovačka
0,1000	Koprivničko-križevačka
0,1000	Krapinsko-zagorska
0,1000	Primorsko-goranska
0,1000	Sisačko-moslavačka
0,1000	Šibensko-kninska
0,1000	Virovitičko-podravska
0,1000	Vukovarsko-srijemska
-0,0284	Varaždinska
-0,5818	Zagrebačka
-1,1916	Splitsko-dalmatinska
-1,4147	Međimurska
-1,8202	Požeško-slavonska

Izvor: Obradio autor na temelju podataka iz istraživanja: Kristijan Marić, *Modeli za podizanje izvozne konkurentnosti hrvatskoga gospodarstva*, doktorska disertacija, Digitalni repozitorij ocjenskih radova Sveučilišta u Zadru, 2019: <https://repozitorij.unizd.hr/islandora/object/unizd/%3A3416/datastream/PDF/view>. preuzeto 18.5.2021.

Treba istaknuti da, budući da se radi o vrijednostima omjera prirodnog logaritma, veličina istraživanih uzorka nije toliko bitna za izvođenje zaključka pa se izračunate vrijednosti jačine utjecaja mogu smatrati relevantnima. Vrijednosti jačina utjecaja na stav o važnosti rasterećenja poslovnog sektora od prekomjernih troškova regulative, administracije i nameta prema županijama u kojima su sjedišta izvoznika prikazane su u tablici 7. Ta je mjera najvažnija izvoznicima iz Grada Zagreba, a najmanje važna izvoznicima iz Požeško-slavonske županije. Za izvoznike iz Koprivničko-križevačke županije vrijednost jačine utjecaja, odnosno varijable *Težina dokaza* je prema smjernicama autora metode ispravljena na 0,1000 jer niti jedan izvoznik nije imao stav da im rasterećenja poslovnog sektora od prekomjernih troškova regulative, administracije i nameta nema visoku razinu prioriteta pa stvarnu

vrijednost jačine utjecaja nije moguće izračunati jer bi prema formuli za korištenje metode trebalo dijeliti s vrijednosti 0.

Tablica 8. Vrijednosti jačine utjecaja za stav koji se odnosi na važnost poticanja ulaganja u istraživanje i inovacije prema sjedištu izvoznika

Vrijednost varijable <i>Težina dokaza</i>	Županija sjedišta
0,4700	Varaždinska
0,2469	Grad Zagreb
0,1823	Koprivničko-križevačka
0,1000	Istarska
0,1000	Karlovačka
0,1000	Krapinsko-zagorska
0,1000	Požeško-slavonska
0,1000	Vukovarsko-srijemska
-0,1000	Virovitičko-podravska
-0,2231	Brodsko-posavska
-0,2231	Primorsko-goranska
-0,2231	Sisačko-moslavačka
-0,2231	Splitsko-dalmatinska
-0,4855	Zagrebačka
-0,9163	Bjelovarsko-bilogorska
-0,9163	Međimurska
-0,9163	Šibensko-kninska

Izvor: Obradio autor na temelju podataka iz istraživanja: Obradio autor na temelju podataka iz istraživanja: Kristijan Marić, *Modeli za podizanje izvozne konkurentnosti hrvatskoga gospodarstva*, doktorska disertacija, Digitalni repozitorij ocjenskih radova Sveučilišta u Zadru, 2019: <https://repozitorij.unizd.hr/islandora/object/unizd%3A3416/datastream/PDF/view>. preuzeto 18.5.2021.

Vrijednosti jačina utjecaja na stav o važnosti poticanja ulaganja u istraživanje i inovacije te razvoj poduzetništva putem EU programa i ostalih javnih sredstava prema županijama u kojima su sjedišta izvoznika prikazane su u tablici 8. Ta je mjera najvažnija izvoznicima iz Varaždinske županije i Grada Zagreba, a najmanje važna izvoznicima iz Bjelovarsko-bilogorske, Međimurske i Šibensko-kninske županije. Za izvoznike iz Koprivničko-križevačke županije vrijednost jačine utjecaja, odnosno varijable *Težina dokaza* je 0,1823 što ih smješta na treće mjesto jačine utjecaja na stav o važnosti poticanja ula-

ganja u istraživanje i inovacije te razvoj poduzetništva putem EU programa i ostalih javnih sredstava što znači da za njih ta mjera ima visoki prioritet.

Vrijednosti jačina utjecaja na stav o važnosti umrežavanja izvoznika u zajedničkom nastupu u formalnim klasterima te poticanje na međusobno pomaganje i razmjenu iskustva u inozemstvu prikazane su u tablici 9. Ta je mjera najvažnija je izvoznicima iz Krapinsko-zagorske i Brodsko-posavske županije te Grada Zagreba, a najmanje važna izvoznicima iz Koprivničko-križevačka, Istarske i Požeško-slavonska županije. Vrijednost jačine utjecaja, odnosno varijable *Težina dokaza* na stav o važnosti digitalizacije gospodarstva i industrije izvoznika iz Koprivničko-križevačke županije iznosi -0,1349 što znači da su tu mjeru vrednovali tako da za njih nema visoki prioritet jer je vrijednost negativna.

Tablica 9. Vrijednosti jačine utjecaja za stav koji se odnosi na važnost umrežavanja izvoznika u zajedničkom nastupu u formalnim klasterima prema sjedištu izvoznika

Vrijednost varijable <i>Težina dokaza</i>	Županija sjedišta
0,9933	Krapinsko-zagorska
0,5878	Brodsko-posavska
0,5878	Sisačko-moslavačka
0,3801	Grad Zagreb
0,3001	Karlovačka
0,3001	Varaždinska
0,1178	Splitsko-dalmatinska
0,1000	Bjelovarsko-bilogorska
-0,1000	Međimurska
-0,1000	Virovitičko-podravska
-0,1000	Vukovarsko-srijemska
-0,1054	Primorsko-goranska
-0,1054	Šibensko-kninska
-0,4107	Zagrebačka
-0,5108	Požeško-slavonska
-0,7985	Istarska
-1,2040	Koprivničko-križevačka

Izvor: Obradio autor na temelju podataka iz istraživanja: Obradio autor na temelju podataka iz istraživanja: Kristijan Marić, *Modeli za podizanje izvozne konkurentnosti hrvatskoga gospodarstva*, doktorska disertacija, Digitalni repozitorij ocjenskih radova Sveučilišta u Zadru, 2019: <https://repozitorij.unizd.hr/islandora/object/unizd%3A3416/datastream/PDF/view>. preuzeto 18.5.2021.

Vrijednosti jačina utjecaja na stav o važnosti digitalizacije gospodarstva i industrije prema županijama u kojima je sjedište izvoznika prikazane su u tablici 10. Ta je mjera najvažnija izvoznicima iz Grada Zagreba i Karlovačke županije, a najmanje važna izvoznicima iz Sisačko-moslavačke, Šibensko-kninske i Krapinsko-zagorske županije. Vrijednost jačine utjecaja, odnosno varijable *Težina dokaza* na stav o važnosti digitalizacije gospodarstva i industrije izvoznika iz Koprivničko-križevačke županije iznosi -0,1349 što znači da su tu mjeru vrednovali tako da za njih nema visoki prioritet jer je vrijednost negativna. To znači da je tu mjeru više izvoznika vrednovalo da za njih nema visoki prioritet u odnosu na one za koje ta mjera ima visoki prioritet.

Tablica 10. Vrijednosti jačine utjecaja za stav koji se odnosi na važnost digitalizacije gospodarstva i industrije prema sjedištu izvoznika

Vrijednost varijable <i>Težina dokaza</i>	Županija sjedišta
0,2134	Grad Zagreb
0,1528	Karlovačka
0,1000	Bjelovarsko-bilogorska
0,1000	Istarska
0,1000	Međimurska
0,1000	Požeško-slavonska
0,1000	Primorsko-goranska
0,1000	Varaždinska
0,1000	Vukovarsko-srijemska
-0,0941	Zagrebačka
-0,1000	Virovitičko-podravska
-0,1349	Koprivničko-križevačka
-0,5404	Brodsko-posavska
-1,0104	Splitsko-dalmatinska
-1,2335	Krapinsko-zagorska
-1,2335	Šibensko-kninska
-1,9267	Sisačko-moslavačka

Izvor: Obradio autor na temelju podataka iz istraživanja: Obradio autor na temelju podataka iz istraživanja: Kristijan Marić, *Modeli za podizanje izvozne konkurentnosti hrvatskoga gospodarstva*, doktorska disertacija, Digitalni repozitorij ocjenskih radova Sveučilišta u Zadru, 2019: <https://repozitorij.unizd.hr/islandora/object/unizd%3A3416/datastream/PDF/view>. preuzeto 18.5.2021.

Vrijednosti jačina utjecaja na stav o važnosti podrške države u izvan-sudskom rješavanju prekograničnih problema prema županijama u kojima je sjedište izvoznika prikazane su u tablici 11. Ta je mjera najvažnija izvoznicima iz Karlovačke i Bjelovarsko-bilogorske županije, a najmanje važna izvoznicima iz Krapinsko-zagorske i Koprivničko-križevačke županije. Vrijednost jačine utjecaja, odnosno varijable *Težina dokaza* na stav o važnosti digitalizacije gospodarstva i industrije izvoznika iz Koprivničko-križevačke županije iznosi -0,8721, što znači da su tu mjeru vrednovali tako da nema visoki prioritet jer je vrijednost negativna. To znači da je tu mjeru više izvoznika ocijenilo da za njih nema visoki prioritet u odnosu na one za koje ta mjera ima visoki prioritet.

Tablica 11. Vrijednosti jačine utjecaja za stav koji se odnosi na važnost podrške države u izvan-sudskom rješavanju prekograničnih problema

Vrijednost varijable <i>Težina dokaza</i>	Županija sjedišta
1,6128	Karlovačka
1,3251	Bjelovarsko-bilogorska
0,6320	Varaždinska
0,2872	Zagrebačka
0,2265	Međimurska
0,1000	Šibensko-kninska
-0,1000	Virovitičko-podravska
-0,1000	Vukovarsko-srijemska
-0,1591	Grad Zagreb
-0,1789	Požeško-slavonska
-0,4666	Brodsko-posavska
-0,4666	Istarska
-0,4666	Primorsko-goranska
-0,4666	Sisačko-moslavačka
-0,4666	Splitsko-dalmatinska
-0,8721	Koprivničko-križevačka
-0,8721	Krapinsko-zagorska

Izvor: Obradio autor na temelju podataka iz istraživanja: Obradio autor na temelju podataka iz istraživanja: Kristijan Marić, *Modeli za podizanje izvozne konkurentnosti hrvatskoga gospodarstva*, doktorska disertacija, Digitalni repozitorij ocjenskih radova Sveučilišta u Zadru, 2019: <https://repozitorij.unizd.hr/islandora/object/unizd%3A3416/datastream/PDF/view>. preuzeto 18.5.2021.

Vrijednost jačine utjecaja, odnosno varijable *Težina dokaza* na stav o važnosti digitalizacije gospodarstva i industrije izvoznika iz Koprivničko-križevačke županije iznosi 0,6869, što znači da su tu mjeru vrednovali tako da za njih ima visoki prioritet jer je vrijednost pozitivna.

Tablica 12. Vrijednosti jačine utjecaja za stav koji se odnosi na važnost razvoja sustava akreditacija i međunarodnih sporazuma prema sjedištu izvoznika

Vrijednost varijable <i>Težina dokaza</i>	Županija sjedišta
1,1977	Primorsko-goranska
0,6869	Koprivničko-križevačka
0,6869	Krapinsko-zagorska
0,2814	Brodsko-posavska
0,2814	Sisačko-moslavačka
0,1000	Bjelovarsko-bilogorska
0,1000	Istarska
0,1000	Karlovačka
0,1000	Šibensko-kninska
-0,0063	Varaždinska
-0,1000	Virovitičko-podravska
-0,1000	Vukovarsko-srijemska
-0,1064	Zagrebačka
-0,2207	Grad Zagreb
-0,4117	Međimurska
-0,8172	Požeško-slavonska
-1,1049	Splitsko-dalmatinska

Izvor: Obradio autor na temelju podataka iz istraživanja: Obradio autor na temelju podataka iz istraživanja: Kristijan Marić, *Modeli za podizanje izvozne konkurentnosti hrvatskoga gospodarstva*, doktorska disertacija, Digitalni repozitorij ocjenskih radova Sveučilišta u Zadru, 2019: <https://repozitorij.unizd.hr/islandora/object/unizd%3A3416/datastream/PDF/view>. preuzeto 18.5.2021.

To znači da je tu mjeru više izvoznika vrednovalo da za njih ima visoki prioritet u odnosu na one za koje ta mjera nema visoki prioritet.

3. ZAKLJUČAK

Rezultati istraživanja Marića pokazuju da su hrvatski izvoznici iznimno zainteresirani za državne mjere kojima bi se, između ostalih, poticala ulaganja u istraživanje i inovacije te digitalizaciju kako bi se unaprijedila kvaliteta njihova poslovanja što bi rezultiralo povećanjem hrvatske konkurentnosti. Budući da veličina istraživnog uzorka podataka u istraživanju nije bila dovoljno velika u ovom se je istraživanju analiziralo postoje li razlike u stavovima svih i izvoznika iz hrvatske regije Sjever koji predstavljaju stratificiran uzorak u kojem se očekuje manja varijabilnost stavova. U slučaju ako ne postoji statistički značajna razlika u stavovima svih i izvoznika iz stratificirane skupine ta bi činjenica povećala relevantnost Marićevog istraživanja

Na temelju vrijednosti $P(T \leq t)$ *two-tail* iz tablica 1. - 6., vidljivo je da je za pet analiziranih državnih mjera koje bi trebala rezultirati povećanjem hrvatske gospodarske konkurentnosti ključna vrijednost na temelju koje se izvodi zaključak o postojanju statistički značajne razlike aritmetičkih sredina veća od 0,05, odnosno od manje strogo kriterija. Za jednu analiziranu državnu mjeru koja bi trebala rezultirati povećanjem hrvatske gospodarske konkurentnosti vrijednost $P(T \leq t)$ *two-tail* je manja od 0.05, ali veća od 0.01, odnosno strožeg kriterija statističke značajnosti. Vrijednost $P(T \leq t)$ *two-tail* se odnosi na postotak vjerojatnosti da je zaključak da postoji razlika aritmetičkih sredina dvaju promatranih skupova podataka, koji u ovom istraživanju predstavljaju odgovore o razini važnosti istraživanih državnih mjera, pogrešno izveden. Dakle, budući da je za svih šest istraživanih mjera koje bi mogle povećati hrvatsku gospodarsku konkurentnost postotak da je izveden zaključak o postojanju razlike u stavovima svih i izvoznika iz regije Sjever pogrešan veći od 0,01 odnosno od strožeg kriterija značajnosti izvodi se konačan zaključak da ne postoji razlika u stavovima svih i izvoznika iz regije Sjever o važnosti istraživanih državnih mjera koje bi mogle povećati hrvatsku gospodarsku konkurentnost. Ti zaključci potvrđuju relevantnost zaključaka istraživanja Marića zato što su izvedeni na temelju stratificiranih podataka koji smanjuju varijabilnost promatranih pojava, u ovom istraživanju stavova izvoznika o državnim mjerama koje bi mogle povećati hrvatsku gospodarsku konkurentnost. Na temelju rezultata ovog istraživanja hrvatski bi izvoznici raspolagali argumentima za inzistiranjem na donošenju državnih mjera koje bi povećale konkurentnost hrvatskog gospodarstva.

Za tri od šest analiziranih državnih mjera izvoznici iz Koprivničko-križevačke županije o važnosti državnih mjera koje bi mogle povećati hrvatsku gospodarsku konkurentnost imaju stav da te mjere za njih imaju nisku razinu

prioriteta. To znači da je više izvoznika te mjere vrednovalo niskom razinom prioriteta u odnosu na izvoznike koji su te mjere vrednovali visokom razinom prioriteta. To su mjere koje se odnose na umrežavanje izvoznika u zajedničkom nastupu u formalnim klasterima, digitalizacije gospodarstva i industrije te podršku države u izvansudskom rješavanju prekograničnih problema. Državne mjere koje se odnose na rasterećenja poslovnog sektora od prekomjernih troškova regulative, poticanja ulaganja u istraživanje i inovacije te razvoja sustava akreditacija i međunarodnih sporazuma više izvoznika iz Koprivničko-križevačke županije je vrednovalo visokom razinom prioriteta u odnosu na izvoznike koji su te mjere vrednovali niskom razinom prioriteta uz napomenu da mjeru koja se odnosi na rasterećenje poslovnog sektora od prekomjernih troškova regulative niti jedan izvoznik iz Koprivničko-križevačke županije nije vrednovao niskom razinom prioriteta.

Abstract:

ANALYSIS OF ATTITUDES TOWARDS MEASURES
WHICH COULD INCREASE COMPETITIVENESS
OF THE CROATIAN ECONOMY

Due to excessive macroeconomic imbalances, the European Commission (EC) in 2014 determined a set of economic indicators that it monitored. For example, one of them referred to the low level of export earnings, especially goods. Furthermore, the competitiveness of the Croatian economy was monitored. The subject of research in this paper are the attitudes of exporters from the Croatian region North. The aim of the research is to find out whether there are differences in attitudes about state measures that could increase the Croatian competitiveness of exporters from the Croatian region North in relation to exporters from all Croatian counties. The researched state measures are related to encouraging exporters to invest in research, innovation and digitalization in order to improve the quality of their business, which would result in increased Croatian competitiveness. Furthermore, the second goal of the research is to describe the strength of the influence of exporters from Koprivnica-Križevci County on attitudes about the importance of all six analyzed state measures that could increase Croatia's economic competitiveness. The research concludes that there is no statistically significant difference in the attitudes of exporters from the North region in relation to exporters from all Croatian counties on state measures that could increase Croatian economic competitiveness if the stricter criterion of statistical significance is taken into account. Furthermore, for three of the six researched state measures that could increase Croatia's economic competitiveness, exporters from Koprivnica-Križevci County are of the opinion that these measures

have a low level of priority for them, and for three that these measures have a high level of priority.

Key words: quality, state measures, investments in quality improvement, competitiveness of the Croatian economy, attitudes of exporters, Koprivnica – Križevci County.

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NATIONAL PROJECT OF SLOVAK REPUBLIC - IMPLEMENTATION AND SUPPORT OF QUALITY MANAGEMENT IN PUBLIC ADMINISTRATION

**NACIONALNI PROJEKT REPUBLIKE SLOVAČKE -
IMPLEMENTACIJA I PODRŠKA UPRAVLJANJU KVALITETOM
U TIJELIMA JAVNE UPRAVE**

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ABSTRACT

Slovak Office of Standards, Metrology and Testing as the coordinator of the national quality policy in the Slovak Republic implements national project with the aim of supporting the implementation of quality management systems in public administration organizations and spread the word about quality in public sector. Thanks to this initiative, the CAF model has been implemented in 28 organizations, the EFQM excellence model in 1 organization and ISO 9001 in 7 organizations. In addition to that, the newly established CAF centre has trained 2,929 public employees on a variety of quality and improvement topics, such as quality management techniques and tools, CAF model, ISO 9001, process management, change management, SWOT analysis and many others. Besides that, the Office organised 3 conferences related to quality and created methodological materials to support benchmarking, social responsibility and gathering feedback.

Key words: quality management systems, the CAF model, public administration, continual improvement process, social responsibility

1. ESSENTIAL INFORMATION ABOUT NATIONAL PROJECT

The quality of a country's public administration and governance matters. It is the foundation for the functioning of the state, considering the needs of citizens and businesses are met through the services of public administrations. An effective, agile and efficient public administration is thus essential for well-functioning country. Some other components of good administration are transparency, accountability, adaptability and capacity for change. Every organization faces new challenges on a daily basis, hence reform must be an integral part of the processes. It could prepare the ground for continuous improvement, which could be difficult, but worthwhile. On this path are tools like self-assessment and the exchange of experience very helpful. The EU also emphasise the need for strong national public administration and that is why are the practices of the Member States of the European Union often compared.

The results of such comparing often lead to the identification of those countries which lag behind the average set by other Member States. This way were defined also the weaknesses of the functioning of public administration in Slovakia. It displayed, among other things, lack of quality management and related tools in public administration organizations, that are commonly used in private sector organizations. In order to remedy this situation it was decided to launch the national project Implementation and Support of Quality Management in Public Administration Organizations. Authority managing the project is Slovak Office of Standards, Metrology and Testing (hereinafter referred to as the "Office").

The starting point for the project plan was the The Analysis of Quality Management in Public Administration, conducted by the Ministry of Interior of the Slovak Republic in 2015. The study analyzed the current status quality management implementation in central state administration bodies:

- lack of quality management implementation in public administration organizations,
- lack of adequate knowledge and skills of employees of public administration organizations about quality management tools and their benefits for the functioning of the organization,
- not paying enough attention to good practices in quality management and benchlearning and benchmarking activities,
- the absence of a single centre supporting and assisting public administration organizations in quality management,
- lack of adequate knowledge about quality management in public administration, no established website to obtain relevant information,
- no supporting tool to facilitate the self-assessment process,

- lack of continuity in organizations that have already implemented one of the quality management tools in the past.

The Analysis of Quality Management in Public Administration focused mainly on central state administration bodies when listing problem areas, but a similar description suits also regional and local government organizations, including organizations which falls within the scope of local governments (primary, secondary schools, social facilities, etc.). Managers of public administration organizations are not aware of the benefits that quality management systems bring to the organization, hence they do not initiate their implementation. Raising awareness of TQM models is therefore a prerequisite for change.

In this regard, Slovak Republic was inspired by the widespread practice in EU countries. Various projects aimed at the implementation of quality management systems in public administration organizations have already taken place in there. A lot of countries have focused on the CAF, total quality management model, which is free tool developed specifically for the public sector. Apart from CAF, the national project of the Slovak Republic is focusing also on the implementation of the EFQM excellence model and the ISO 9001 quality management system. The target group of the project are central state administration bodies and contributory and budgetary organizations, as well as other public administration organizations. The recipients of their services are the citizens who are thus affected by the project through the improvement of the services provided. The project also includes the establishment of a quality centre and Quality website, as well as it supports the formation of partnerships with quality experts, exchange of good practices and benchmarking.

The intention to improve public administration organizations follows the objectives of the Europe 2020 Strategy along with the priorities of the Manifesto of the Government of the Slovak Republic 2016 - 2020.

2. IMPLEMENTATION OF NATIONAL PROJECT

Based on described situation and in accordance with EU priorities, the goal of the national project “Implementation and support of quality management in public administration organizations” was set. It is to contribute to increasing efficiency and quality of management of public administration organizations through main activity of the national project, which is “Development of quality management in public administration organizations”. This activity is further divided into two parts:

1. Implementation of quality management in central state administration bodies and contributory and budgetary organizations;
2. Establishment of CAF centre.

Duration of the national project is 51 months, starting in September 2018. The professional and administrative completion of the national project is scheduled for November 2022. The time schedule was set to optimize resources and for the needs of partners in achieving their tasks and goals.

National project is supported by European Social Fund through Operational Programme Effective Public Administration (OP EPA). The amount of given non-refundable financial contribution is 7,653,215.27 €. The Managing Authority for the OP EPA is Ministry of the Interior of the Slovak Republic.

2.1. Implementation of quality management in central state administration bodies and contributory and budgetary organizations

Within the first part of the national project, 19 partner organizations (central state administration bodies and contributory and budgetary organizations) are implementing the CAF model, the EFQM excellence model, the ISO 9001 quality management system and the pilot implementation of ISO 37001 anti-bribery management systems. All partner organizations have a partnership agreement with the Office. The Office is the coordinator of national quality policy of the Slovak republic, which is defined in the National Quality Programme of the Slovak Republic 2017 - 2021 (NQP SR)¹. One of the vital goals of NQP SR is the development of quality management. The Office acts as national provider of the CAF External Feedback Procedure and National CAF Correspondent, and as such is a member of the network of National CAF Correspondents supported by European Institute of Public Administration (EIPA).

¹ National Quality Programme of the Slovak republic 2022 – 2026 was approved by a Government Resolution on December 8th, 2021. The strategic goals of the programme are, among others, quality management, continuous improvement of organizations and recognition of private and public sector organizations.

Table 1. Contracting partner organizations of national project

Ministry of the Interior of the Slovak Republic	CAF
Ministry of Education, Science, Research and Sport of the Slovak Republic	CAF
Ministry of the Environment of the Slovak Republic	CAF
Ministry of Defense of the Slovak Republic	CAF
Ministry of Health of the Slovak Republic	CAF
Ministry of Culture of the Slovak Republic	CAF
Ministry of Finance of the Slovak Republic	EFQM
Government Office of the Slovak Republic	CAF, ISO 37001
Ministry of Investments, Regional Development and Informatization of the Slovak Republic	ISO 9001, ISO 37001
Public Procurement Office	ISO 9001
Industrial Property Office of the Slovak Republic	CAF
Administration of State Material Reserves of the Slovak Republic	CAF
National Security Authority	CAF
Statistical Office of the Slovak Republic	ISO 9001
Slovak Metrological Inspectorate	ISO 9001, ISO 37001
Slovak Environmental Inspectorate	CAF
State Veterinary and Food Administration of the Slovak Republic	CAF
Central Office of Labor, Social Affairs and Family of the Slovak Republic	ISO 9001
Regional Office of Public Health of Levice	ISO 9001
Slovak Office of Standards, Metrology and Testing	ISO 9001, ISO 37001, CAF

Source: Made by authors.

The aim of the implementation of these tools is to contribute to improving the quality of services provided by these organizations and thus contribute to increasing customer / citizen satisfaction. At present (as of December 31, 2021), 19 of the 28 implementations have been completed.

The implementation process of mentioned tools is covered in usual steps, which means that CAF implementation terminates by obtaining the CAF Effective User Label, EFQM model implementation by achieving the level of “Committed to Excellence” and the implementation of quality management system according to ISO 9001 and anti-bribery management according to ISO 37001 standard by obtaining corresponding certificate. Implementation of each of these systems requires the involvement of internal capacities and in-house people of an organization (project leader / quality manager and members of the self-assessment group with the cooperation

of relevant employees). Each implementation takes approximately 18 - 24 months, depending on the implemented model/system. In total, almost 400 employees of partner organizations were involved.

Slovak Office of Standards, Metrology and Testing itself has implemented a quality management system according to the standard STN EN ISO 9001:2016, as well as anti-bribery management system according to the standard STN EN ISO 37001:2019. The CAF implementation has started at the Office in September 2020, which means that the international evaluation of the External Feedback is scheduled for April 2022.

2.2. Establishment of CAF centre

The second part of national project focuses on the establishment of CAF centre at the Office as one of many similar centres that have sprung up across Europe. These centres offer training activities and consultations in the field of quality management, as well as they provide support for benchlearning and benchmarking activities. The CAF centre has joined their efforts while it also encourages cooperation among these centres (national resource centres) and the members of the EUPAN (European Union Public Administration Network). The intention of the CAF centre is to increase awareness of quality management in various types of public administration organizations while it helps to increase the rate of implementation of quality management in those organizations and it supports the exchange of experience and dialogue on best practice. CAF centre services include:

- providing fundamental consultation in the field of quality management,
- providing training activities on various professional topics,
- publishing professional methodologies and studies,
- providing support to organizations implementing CAF (15 implementations),
- providing information concerning quality (both from home and abroad), supporting the exchange of good practices, building partnerships (CAF centre website: <https://cafcentrum.unms.sk/>).

2.2.1. Providing fundamental consultation in the field of quality management

The professional staff of the CAF centre is at disposal for any organization interested in quality management systems. Consultations can be conducted in person in the CAF centre or online. Moreover, these information meetings are suitable for all - organizations considering the implementation of one of

the quality management systems, organizations that seek advice or inspiration while they are already implementing one of quality management system and those looking for opportunities for further improvement. As a CAF centre, its employees pay special attention to the CAF model, but detailed information on ISO 9001 standard or EFQM model may also be provided.

2.2.2. Providing training activities on various professional topics

CAF centre offers various types of educational activities - training, workshops, seminars. The target group is personnel of public administration organizations, and the training takes place either in the training room of the CAF centre, directly at the organization's headquarters (so-called in-house training) or online, which was used quite often due to the pandemic. The CAF centre currently offers 35 training topics, which are listed on the CAF centre website². There is no participation fee, all experts providing training activities are paid from the project funds. The main purpose of these educational activities is to increase the awareness of public administration employees and managers about quality, as we consider raising awareness and acquiring knowledge to be a basic prerequisite for the development of quality management.

Since the beginning of the national project until the end of 2021, 177 educational activities have been planned, conducted and evaluated and 2,929 public administration employees have been trained. These informations are obtained from the CAF centre database.

2.2.3. Publishing professional methodologies and studies

Analytical and methodological activities of the CAF centre are closely related to the already mentioned training activities. CAF centre publishes professional methodologies, studies, instructions and other documents with the intention of helping public administration organizations with the implementation of new procedures, facilitate problem analysis or applying experience or good practice. All published materials are developed in close cooperation with experts who have many years of experience in the field of quality. The focus areas of studies and methodologies are those not covered sufficiently in Slovakia. Up to the end of 2021, four professional methodologies have been issued - *Self-assessment Tool for Culture of Quality*, *Gathering Feedback from Stakeholders*, *Development of Benchmarking in the Public*

² <https://cafcentrum.unms.sk/ponuka-vzdelavacich-aktivit-caf-centra>

Sector and “EASY CAF”, while in the process of preparation are methodologies Application Guide for CAF and Implementation of management systems in public administration organizations.

Regarding professional studies, CAF centre already published the first one - *Corporate Social Responsibility in Public Sector*, as CSR is still associated primarily with the private sector in Slovakia. This study can help provoke a shift offering specific guidelines for the implementation of CSR principles into daily practice of public administration organizations. Besides there are 2 more studies planned to be published - *Effective management of public administration institution using management system standards* and *Application problems in CAF implementation*. Many of these methodologies and studies will become the subject of training activities.

2.2.4. Providing support to organizations implementing CAF (15 implementations)

As the CAF national correspondent, the Office strives to expand the base of CAF users among public administration organizations, therefore the national project has offered its support to 15 public administration organizations that have expressed interest in CAF implementation. These organizations are free to use training, consulting and assessment activities of CAF centre during the whole time of CAF implementation process until it is awarded with the CAF Effective User Label. The CAF Centre will provide a trainer / consultant for these organizations, who will conduct the trainings of the self-assessment group and guide the group while preparing an improvement plan and materials for CAF External Feedback Procedure. The CAF centre will also provide external evaluators who will analyse the organization’s self-assessment report and carry out an on-site visit, as well as CAF External Feedback Actors providing CAF External Feedback Procedure. Based on the collected insights the feedback is formulated and the decision for awarding the label ‘effective CAF user’ is prepared. Subsequently the Office as the national provider of CAF External Feedback Procedure will deliver the internationally recognized CAF Effective User Label to the awarded organization.

The selection of organizations to which this support is provided was based on calls for expression of interest for participation in a national project. The first two calls were issued in 2019, when 7 public administration organizations were involved. The third call was issued in November 2020, however, this call had to be repeated in 2021, as the COVID-19 crisis forced many organizations interested in CAF implementation to reassess their current

capabilities. As a result several organizations decided to withdraw from the partnership agreement. A selection process was closed in September 2021 with a total number of 5 calls and 15 selected organizations.

Table 2. Organizations selected for the national project, stated with their extent of CAF implementation

1.	City District of Bratislava-Staré Mesto	100% - ECU label
2.	Business Academy in Nitra	100% - ECU label
3.	National Institute for Education in Slovak republic	100% - ECU label
4.	Secondary Technical School of Electrical Engineering, Hálova	100% - ECU label
5.	Secondary Vocational School of Business and Services, Čadca	100% - ECU label
6.	Municipality Sabinov	100% - ECU label
7.	Secondary Vocational School Pruské	100% - ECU label
8.	Municipality Nitra	71%
9.	Municipality Liptovský Mikuláš	64%
10.	Municipality Žilina	50%
11.	Municipality Vysoká nad Kysucou	71%
12.	Municipality Šaľa	50%
13.	City District of Bratislava-Vajnory	64%
14.	Environmental fund	15%
15.	Municipality Skalica	15%

Source: Made by authors, data as of the end of 2021.

Seven organizations involved in national project in 2019 have already completed the CAF implementation and were awarded with CAF Effective User Label. This European label is valid for 2 years. Organizations involved in national project and binded by agreement with Slovak Office of Standards, Metrology and Testing are obliged to ensure the sustainability of the CAF model by repeating self-assessment and reclaiming the CAF Effective User Label. Termination of CAF implementation process of last organizations involved in the project (Environmental Fund, Municipality Skalica) is scheduled for November 2022.

2.2.5. Providing information concerning quality (both from home and abroad), exchange of good practices, building partnerships

One of the intentions of national project was establishment of Quality website³, which serves as a complex information tool for the development of quality management in public administration. The aim is to keep all important information regarding quality management in one place. The website thus offers informations about national and international events related to quality, glossary of quality management terms, professional methodologies and studies published by the Office, examples of good practice, the possibility of registering for conferences, trainings, seminars, workshops and suchlike.

One of regularly organized events in Slovakia is a Conference on Quality, which annually brings together people with common interests to discuss quality topics. At the Conference are presented also the best results achieved by public administration organizations, which are this way recognized. Moreover, their work can be an inspiration for others to improve themselves, not to mention that events like these provide a chance to build new benchmarking partnerships.

Annual Conference on Quality was in 2020 postponed due to the impact of the pandemic. However, on October 6, 2021, an online Conference on Quality in Education was organized for the first time. This event was intended mainly for representatives of secondary schools. The aim was to contribute to the sharing of good practice between secondary schools and to inspire other secondary schools to embark on the path of quality. Quality conference for municipalities is scheduled for 2022.

In order to honor performance excellence and to inspire those interested in quality, the Office organizes various competitions. Among them, National Quality & Social Responsibility Award of the Slovak Republic rewarding quality results and socially responsible behavior, Top Quality Managers Competition awarding managers and Award for the best journalistic contribution in the field of quality. Due to the unusual circumstances related to the pandemic and lack of funds, the competitions did not take place in 2019 – 2021. However, these competitions are projected to continue in 2022.

Slovak Office of Standards, Metrology and Testing, as National CAF Correspondent, cooperates closely with the European Institute of Public Administration (EIPA) and thus regularly informs the Slovak community of experts about opportunities to participate in conferences, seminars and workshops organized by EIPA. At the same time, the Office regularly informs

³ <https://cafcentrum.unms.sk/>

EIPA about Slovak organizations awarded with ECU label as well as it provides its cooperation in projects and research carried out within EIPA or EUPAN. At present (as of December 31, 2021), the Office is a member of the CAF Education revision working group and it provides its support to OECD within their project “Strengthening the resilience of public administrations after covid-19 with CAF”. All in all, Slovak Office of Standards, Metrology and Testing holds responsibility for the CAF promotion in Slovakia and act as a point of contact for foreign insitutions in terms of CAF.

3. SUSTAINABILITY OF THE RESULTS OF THE NATIONAL PROJECT

The sustainability of the project results will be ensured by the national project partners, who are contractually obliged to maintain the implemented quality management tool in their organization. Financial sustainability will be ensured from the partner’s finances.

As for the CAF centre, sustainability will be ensured by CAF centre staff who will provide assistance and support to public administration organizations in the field of quality management even after the project ends. Further activities of the CAF centre will be covered by the state budget. The Quality website will remain functional in order to keep track of results of national project and to keep working on the main ideas of national project.

Moreover, one of the aims of the project is to support the formation of partnerships and it is these partnerships that can contribute to the sustainability of the national project. Sharing good practice and experience can lead to improvement of services delivered by public administration organizations, which can inspire other organizations to improve their own services and processes. This is a hidden impact of the results of the national project, which, however, is not negligible at all and can significantly contribute to satisfaction of the customers/citizens of the Slovak Republic.

Sažetak:

NACIONALNI PROJEKT REPUBLIKE SLOVAČKE -
IMPLEMENTACIJA I PODRŠKA UPRAVLJANJU KVALITETOM
U TIJELIMA JAVNE UPRAVE

Slovački ured za standarde, mjeriteljstvo i ispitivanje kao koordinator nacionalne politike kvalitete u Slovačkoj Republici provodi nacionalni projekt s ciljem podrške

implementaciji sustava upravljanja kvalitetom u tijelima javne uprave i širenja ideje o kvaliteti u javnom sektoru. Zahvaljujući ovoj inicijativi CAF model implementiran je u 28 tijela javne uprave, EFQM model izvrsnosti u 1 tijelo javne uprave i ISO 9001 u 7 tijela javne uprave. Osim toga, novouspostavljeni CAF centar je educirao 2.929 javnih djelatnika o raznim temama kvalitete i poboljšanja, kao što su tehnike i alati upravljanja kvalitetom, CAF model, ISO 9001, upravljanje procesima, upravljanje promjenama, SWOT analiza i mnoge druge. Osim toga, Ured je organizirao 3 konferencije o kvaliteti i izradio metodologiju za podršku benchmarkingu, društvenoj odgovornosti i prikupljanju povratnih informacija.

Ključne riječi: sustav upravljanja kvalitetom, CAF model, javna uprava, proces stalnog poboljšavanja, društvena odgovornost.

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QUALITY OF THE HIGHEST QUALIFIED STAFF PEDAGOGICAL TRAINING

KVALITETA PEDAGOŠKOG OSPOSOBLJAVANJA
VISOKO KVALIFICIRANOG OSOBLJA

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ABSTRACT

The world's universities were embarking on a qualitatively new path of development in the third decade of the 21st century. The world experience of realization of pedagogical training of personnel for universities capable to solve actual problems of higher education within programs of training of personnel of the highest qualification (on the example of the Russian Federation, the Czech Republic and the Ki-Thai People's Republic) is analyzed. Invariant features of high-quality preparation of doctoral students are defined.

Keywords: quality of higher education, personnel, training of higher qualification.

1. INTRODUCTION

Modern higher education is developing under the influence of the phenomena of digitalization, internationalization and monetization of intellectual products. Innovative processes characteristic of the 20th century world education are being stabilized, which actualizes attention to the quality of processes in education and related spheres^{1,2,3}. The quality of education is determined, not least, by the quality of the educational process and its' pedagogical maintenance. The structure of the academic staff of universities is complex, as it can be built on different grounds (qualification, growth, correlation of personal goals of the staff and strategic goals of universities, etc.). Modern advanced universities of the Russian Federation (RF) are approaching the average age of 45⁴. In the Czech Republic (CR), the average age of employment in this occupational group is 44.6 years. This is 2.1 years longer than the average age of all workers. In general, the group of professions teachers and other education specialists is the 10th oldest of all groups of professions in the CR. In the People's Republic of China (PRC), the average age of university professors is nearly 10 years lower. In all countries, however, a high percentage, albeit different, of the academic staff aged 50-60 and over have difficulty in pursuing the strategic directions of modern universities reflected in their performance assessment criteria, such as digital transformation, internationalization of higher education and monetization of intellectual property products. The current paradigm shift in education and research at universities in the CR affects the professionalism of academic activities and imposes new requirements on university professors. Although the current educational policy documents guarantee the status of the university as a scientific community, it also requires a high level of pedagogical competence of university teachers,

¹ Juhani Anttila, "ISO 9004 - A stimulating quality management standard for the creative leaders of contemporary organizations", *Proceedings of the 21st International Symposium on Quality "Quality – yesterday, today, tomorrow"*, Croatian Quality Managers Society, Zagreb, Crikvenica, 2020, pp. 79-104.

² Miroslav Drljača, "Dynamics of development of a generic model of an integrated management systems", *Proceedings of the 21st International Symposium on Quality "Quality – yesterday, today, tomorrow"*, Croatian Quality Managers Society, Zagreb, Crikvenica, 2020, pp. 45-58.

³ Gennady N. Serikov, Sergei Grigorevich Serikov, "Education quality as a value", *Bulletin of the South Ural State University, Series: Education, healthcare, physical education*, No, 29 (129), 2008, pp.14–34.

⁴ *Indicators of education: 2021: statistical collection*, N.V. Bondarenko, L.M. Gokhberg, V. I. Kuznetsova and others; National research University "Higher School of Economics", M.: NRU HSE, 2021.

their responsibility for the education and well-being of students, maintaining high educational standards commensurate with the university level⁵.

This leads to the need to connect the efficiency of universities, in particular, the improvement of the quality of higher education with the quality of staffing the educational process. Despite the fact that universities invest efforts in the development of all levels of pedagogical resources, it is evident that it is expedient to pay attention to the issues of pedagogical training already at the stage of training scientific and pedagogical personnel of higher qualification. Greater attention should be given to work with young staff in order to give them the right impulse and direction for self-development, and to accelerate their adaptation to professional activities in line with university development strategies.

This article is devoted to the analysis and systematization of the models of postgraduate (doctoral) training future academic staff in order to improve the quality of personnel provision of the educational process. To achieve this goal, the following objectives are set and pursued: 1) to identify the criteria of quality of the academic staff for the educational process; 2) to substantiate the choice of young students as the nucleus of academic staff for the quality educational process; 3) to study the experience of educational organizations of highly qualified personnel training for pedagogical activity; 4) to key features of teacher training.

2. METHODS

In order to solve the first problem, the analysis of normative documentation (standards and professional duties of the academic staff) in the RF, the CR and the PRC was carried out; scientific literature on the subject of research was published; the survey of experts was conducted. In the RF, the Professional Standard “Teacher of Professional Training, Professional Education and Further Professional Education” is currently in the process of being finalized, but it can be used, if not as a normative basis, then as an information source describing the functions of a teacher of higher education. The basic requirements for the quality of the university teaching profession are defined in the CR by the Law on Higher Education Institutions (Act No. 111/1998 Coll. on Higher Education Institutions), which combines the quality of the profession with education and the academic title (associate professor, professor). Thus, the quality of the university teacher’s work is mainly included in

⁵ Adriana Wiegerová, *The careers of young Czech university teachers in the field of pedagogy*, Zlin: Tomas Bata University of Zlin, 2016.

the requirements to achieve individual degrees of scientific and pedagogical title. PRC was also developing various performance standards. To a greater extent, researchers of this subject in pedagogical science reveal the required quality of the research.

Experienced, most qualified representatives of the academic staff, specialists in the field of training of highly qualified specialists were selected as experts in the first and third tasks of the research. A group of nine postgraduate experts was formed. In order to identify the most significant criteria for the quality of human resources in the educational process, criteria were first defined on the basis of an analysis of pedagogical literature. Experts were asked to rank the criteria in descending order of importance and to add their own. The list, compiled by the experts, was analyzed and adjusted on the basis of an analysis of the educational needs of the future cadres of higher education. The survey involved 128 postgraduate students (doctoral students), who identified the following areas of competence for further pedagogical self-development: methodical, including digital methodical; communication and variability of the classroom, charisma, stress resistance, – in which they feel poor. As a result, a list of the most significant criteria was formed, which in the state of education form an ideal portrait of a young teacher and can be used to assess the quality of staffing the educational process. Selected criteria for the convenience of further research have been enlarged to develop modules for training future teachers of higher education.

The second task was carried out with the use of theoretical methods of logical inference.

The study of the world experience in promoting the development of young academic staff at the stages of their preparation and adaptation to pedagogical activities was carried out by analyzing the websites of educational institutions of the RF, the CR, and the PRC, as well as by interviewing experts in the field of postgraduate training and adaptation of young teachers of universities. Interviews with experts were used to identify details of the functioning of the models found. For the purpose of providing detailed insights, attention is paid to the analysis of three models of training linked to specific educational organizations of the three countries, which, while not uniform for specific countries, are rather typical for them. These are the following educational organizations: South Ural State University (SUSU), RF; South Bohemian University (SBU), CR and Hebei Institute of International Business and Economics (HIIBE), PRC. The authors used the simulation (modelling) method. Invariant composition-forming models by parameters: organizational bases and content characteristics are described.

The fourth task was also based on the use of theoretical methods and modelling techniques. Invariant features of pedagogical training of the personnel of the highest qualification are revealed. The invariant component of the models of training of highly qualified personnel covering all basic methods of work on the preparation of the national development program has been defined. The developed models were investigated, analyzed and as a result the conclusions about their most significant peculiarities were determined.

3. CRITERIA FOR THE ACADEMIC STAFF QUALITY

According to Federal Law 273 “On Education in the Russian Federation” “the quality of education is a complex characteristic of the educational activity and training of the student, expressing the degree of their compliance with federal state educational standards, educational standards, federal state requirements and (or) according to the needs of the natural or legal person in whose interest educational activity is carried out, including the degree programs”⁶. In other words, by quality we mean the conformity of the educational process and the educational results achieved with the expectations and requirements of the society, state and person itself. The quality of the educational process consists of the quality of the project and its implementation, so the quality criteria cover the requirements of both the projected and the real-life pedagogical support of higher education. The core of the educational process is the interaction between academic staff and students. The measure of competence of scientific and pedagogical workers to the requirements will be called the quality of staffing.

There is no standard for the educational activities of the academic staff (which is in the process of being innovated) in RF. In the previous version of the standard the generalized labor functions of a university teacher were designated (on the example of functions of associate professors):

- Teaching courses, disciplines (modules) on the programs of bachelor, specialist, master, training of personnel of higher qualification and (or) additional professional education (APE);
- Professional support for specialists involved in the implementation of training courses, disciplines (modules), organization of training, research, project and other activities of students under the programs of Higher Education Institutions and (or) APE;

⁶ Federal Law “On Education in the Russian Federation”,
http://www.consultant.ru/document/cons_doc_LAW_140174/ (13.02.2022).

- Directing research, project, educational, professional and other activities of students;
- Development of scientific and methodological support for the implementation of curated training courses, disciplines (modules) of different levels' higher education programs.

Other countries have their own performance standards for academic staff quality. A university lecturer in the CR is defined by law as an academic staff. Thus, the generally defined requirements of the academic profession relate to the quality of his work^{7 8}. They should focus their professional activities on the following areas:

- achieve a high level of scientific erudition,
- to share in the creation of scientific knowledge (i.e., research and development),
- to expert mediation of this knowledge to the young generation (i.e., pedagogical activity)
- and to achieve individual degrees of scientific and pedagogical ranks.

In this context, it is particularly difficult for beginning university teachers to reconcile the positions of the researcher and the teacher⁹.

The mutual acquaintance with the laws on education between the RF and PRC in order to expand cooperation began in 2018. In China, not only masters but also bachelors can work in the higher education system. “At the first employment for the employee who has received the qualification of teacher, should be set a trial period”. The Law of the People’s Republic of China on Higher Education regulates the requirements for university teachers: “Teachers of higher educational institutions to obtain posts must meet the following basic criteria: 1) have the qualification of a teacher of higher education; 2) systematically master the basic theories in a certain field of science; 3) have the necessary pedagogical and educational the pedagogical load required for the post in teaching the disciplines and the number of teaching hours. Specific official conditions for the replacement of teachers in higher

⁷ Philip G. Altbach, *Global perspectives on higher education*, Johns Hopkins University Press, Baltimore, 2016.

⁸ Ulrich Teichler, *Higher Education Systems. Conceptual Frameworks, Comparative Perspectives, Empirical Findings*, Sense-Publishers, Rotterdam, 2007.

⁹ Adriana Wiegerová, “Working at the University: What is the Work of University Teachers?”, *University Teacher – Education, Practice, Position*, Tomas Bata University of Zlin, Zlin, 2019.

educational institutions are set by the State Council”¹⁰

We believe that the generalized labor functions set out in the standards are narrowly oriented to the implementation of the educational process, but are not related to the development of the organization of higher education, part of which is academic staff. However, university today solves multiple problems, not limited to the organization and implementation of the educational process. Our position is that the goals, motives and values of the academic staff should be consistent with the development strategy and corporate values of educational institutions¹¹. Also, the list of duties competently or functionally oriented, but does not pay due attention to the personal characteristics of the young scientific and pedagogical worker. These gaps can be filled by additional requirements on the value system and personal attributes of the academic staff. The most detailed requirements, taking into account all the reasons for their nomination, are investigated by scientists, specialists in the field of university education.

E. V. Tuchina believes that a significant personal characteristic of a young teacher in higher education is the I-concept, the teacher’s awareness of his strengths and weaknesses¹². The model of the ideal teacher of the higher school was developed by a group of scientists from Tyumen State and National Research Tomsk State Universities. The authors distinguish the personal qualities and the socio-professional competences of the academic staff in two aspects: educational and research. Taking into account the specifics of our article, let us consider the part of the ideal model, which characterizes personal qualities and educational activity of a teacher of higher education. Among the qualities important in educational activities, the authors consider the following characteristics of the academic staff:

- professionalism in pedagogical activity, methodological skills;
- continuous professional development and self-education, general erudition of the teacher;
- possession of digital competencies and adaptation to the distance education format;
- personal involvement of the teacher in pedagogical activity;

¹⁰ *Education laws in the People’s Republic of China*, https://spbu.ru/sites/default/files/zakon_ob_obrazovanii_v_kitayskoy_narodnoy_respublike_rus.pdf (13.02.2022).

¹¹ Irina Kotlyarova, Irina Voloshina, Miroslav Prohazka, “Development of the academic staff corporate ethics”, *INTED2016 Proceedings*, 2016, pp. 7409–7415.

¹² E. V. Tuchina, *Difficulties of young teachers of higher education in the organization of educational dialogue*, dissertation abstract for the degree of candidate of pedagogical sciences, Yaroslavl, 2004.

- charisma;
- communication skills of the teacher, allowing to establish trusting relationships with students, find a common language with the audience and approach to everyone for effective work;
- reference personal qualities;
- variability and flexibility of the teacher, his adaptation to the student contingent;
- stress resistance and equanimity;
- critical thinking and reflection¹³.

Obviously, this list expresses the current requirements for academic staff quite fully. At the same time, the problems of formation of mature academic staff need a fairly long period of time, the expected results are difficult to achieve during postgraduate or doctoral studies. In this regard, it was necessary to define the objectives of the first step, which should be focused primarily on the training of young personnel of higher qualification. To this end, an additional survey of postgraduate (doctoral) students was conducted (n=128). Why did we choose postgraduate and doctoral students as subjects of future pedagogical activity? First of all, these students are future or already working teachers of higher school. In spite of the fact that not all postgraduates plan to be engaged in pedagogical activity in the future, they are the main resource of formation of the academic staff. Graduates and doctoral students, as young, most proactive and interested in their subject and scientific field, represent the modern requirements in their field of economics and science best, while older and even middle-aged teachers may lag far behind in their knowledge of the latest technologies. Further training and retraining of such personnel are not always promising and successful. Young teachers have a better command of both universal and professional modern technologies, so their preparation for teaching can be more effective than the training of age teachers. Moreover, long-term experience does not mean high quality of academic activity, because teachers that are not rare between them are adherents of a cognitive paradigm in education, with an authoritarian style of interaction with students. Since these features belong to the price-personal sphere of man, their correction is very difficult, if not impossible. Young postgraduates and doctoral students are more ready to the subject-subject sphere of interaction with students, they have better formed adequate modern communicative competence. A considerable number of post-graduate students are

¹³ Galina Z. Efimova, Aleksander N. Sorokin, M. V. Gribovsky, “Ideal teacher of the higher school: personal qualities and social and professional competences”, *Education and Science*, 2021, №1, pp. 202–230.

former masters and have received sufficient education both in their subject area and in the sphere of scientific and managerial activity in it. At the same time, despite the needs of graduate students, many of them lack competence in pedagogical work, and most of them have little or no experience in it.

As a result of the analysis of scientific literature, the survey of experts and the analysis of requests of students (doctoral students), the most significant quality criteria of young academic staff were revealed:

- awareness and acceptance of the University's corporate values; competence in the subject area; readiness to partner with students, flexibility, ability to adapt to the changing student population;
- understanding of their strengths and weaknesses, directions for self-development based on the combination of personal goals with the development strategy of the educational organization;
- ability to carry out methodological work following competency approach, internationalization phenomena (for international groups, for groups of foreign students, to participate in the development of joint programs) and digital transformation of education (to create methodological products on digital plates, to design the use of electronic resources and digital technologies), to develop different types of occupations on the basis of methodological-pedagogical knowledge;
- readiness to teach (ability to build communication with the use of teaching methods, education, modern technologies and tools; public speaking skills, self-presentation);
- the ability to organize and support individual and group research and project activities of students.

4. THE EDUCATIONAL ORGANIZATIONS' EXPERIENCE FOR THE TRAINING OF HIGHLY QUALIFIED PERSONNEL FOR PEDAGOGICAL ACTIVITY

The generalized competences as the purposes of preparation of post-graduate students (doctoral students) for pedagogical activity serve as the system-forming elements of development of educational courses of pedagogical training of personnel of higher qualification for universities. We investigated the models of postgraduate education in three countries: RF, CR, PRC, which are one of the aspects of their training. Postgraduate (doctoral) program of 26 universities of these countries were analyzed. It was revealed that all postgraduate (doctoral) program involved pedagogical training, which

was carried out in the forms of educational disciplines, additional professional program, training and discussion seminars and pedagogical practice.

The models of pedagogical training of post-graduate students are analyzed in more detail on the examples of three universities of these countries (SUSU, SUSU, HIIBE). It should be noted that despite the typical approaches to the training of young teachers, the training modules reflect the specifics of work in individual educational institutions of these countries, but are not uniform for all universities. Modules are considered in organizational and educational aspects, i.e., we describe them uniformly: organizational basis of training and content of training.

Model of training post-graduate students in SUSU (RF)

There is a great variety of universities in Russia, starting with such world-famous universities as Moscow State University and St. Petersburg State University, federal and national research universities, and ending with small universities in small cities with much less resources, including human resources among them. In spite of the fact that in each area of training in the RF there is a single Federal State Educational Standard (FSFE), the quality of staffing is undoubtedly affected by the level of the university and the conditions in which it is developed. Also, considering more than 1000 universities, we cannot expect that the ways of training future academic staff in all universities will be the same or similar. Nevertheless, if we talk about the preparation of postgraduate students for scientific and pedagogical activities, it is possible to abstract some generalized characteristics of the training of future academic staff due to the fact that there is a FSFE level 3 +, training personnel of higher qualification, which allows determining a certain invariant in their training. It should be noted that we are talking about the current standard, as a change is planned in the nearest future.

FSFE 3 + provide post-graduate students with a number of universal (U), general (GP) and professional (P) competencies, which necessarily include pedagogical competence. In most standards, pedagogical competencies are formulated at the same or similar way. As a typical example, we cite the competence of OP 5 “readiness to teaching activities in the main educational programs of higher education.” This has led to the inclusion of pedagogical courses and pedagogical practices in the postgraduate program. At SUSU it is the course “Theory and Methodology of Professional Education”, as well as the following pedagogical practice. It should be noted that the modes of training at SUSU are very dynamic, they have not been exactly the same in recent years. However, they all have two phases: training of future highly qualified staff to work as academic staff (post-graduate work) and training

of young teachers. At the postgraduate stage, we have experience in implementing three types of training: conducting of training programs “Teacher of Higher Education” (the program was not compulsory at the choice of the trainee, but the majority of the trainees were students of this program); introduction of compulsory courses in the basic educational program of postgraduate students (which is carried out in the modern period); introduction of pedagogical courses and practice as an option. We will consider only one (currently implemented) model in detail.

Organizational basis of training. Currently, advanced training of postgraduate students is the third level of higher education, which is implemented under the FSFE 3+ in all areas of training. Currently, more than 60 training programs are being implemented in SUSU. Training is provided in accordance with the Basic Vocational Education Program (BVEP). These programs are developed at the graduating departments of the institutes. Taking into account the fact that BVEP includes not only aspects of research activities of graduate students, but also their mastering of universal technologies, all BVEP have invariant components (philosophy, foreign language - preparation for the candidate examinations - etc.). They also include the pedagogical component, since pedagogical activity is one of the professional activities of the graduate. This requires the existence of a one-stop shop that can harmonize training in these areas. This center is the department of post-graduate studies (Department of Postgraduate Studies), which determines, in coordination with graduating departments, common disciplines for post-graduate students of all disciplines. At the present time in the university teaching discipline “Theory and methodology of professional education” and pedagogical practice are realized for pedagogical training of all graduate students (more than 60 majors).

Content characteristics of training. Within the framework of the discipline “Theory and Methods of Professional Education” the following sections are considered: “History of Professional Education in Russia”, “Modern Trends in Higher Education”, “System of Higher Education in Russia”, “Educational Process”, “Pedagogical Research”. According to the curriculum of post-graduate students, this is a lecture course, so it is necessary to fill in the gap of practical pedagogical activity. For this purpose, the postgraduate students implement group projects “Development of methodological plan of mastering “lacking competence”. The duration of the training is 108 hours. (3 credits). The theoretical course is followed by an exam.

Implementation of the project is carried out in pedagogical practice (100 hours).

Different forms of training are used: face-to-face, distance (online and offline), mixed. Lectures, consultations and face-to-face, online (depending on the situation) or mixed presentations and discussions of projects prevail. Also, electronic resources are used:

- electronic educational environment of the university based on the LMS-platform MOODLE;
- SUSU library resources with access to information bases of countries of the world;
- open information Internet resources;
- e-learning tools;
- videoconferences ZOOM, Big Blue Button, GoogleMeet.

Various methods of educational interaction are used. We are of the opinion that no methods should prevail, but their different combinations should be applied depending on the tasks of each lesson. Nevertheless, due to the specific nature of the course and semester assignment, we cannot but mention the leading methods and organizational training, the most appropriate specifics of our module:

- project training method;
- a combination of active and interactive methods, teamwork;
- discussions;
- situational methods, case-study.

For students with disabilities, the pedagogical module implements inclusive education, whereby doctoral students of this group participate in all types of educational activities on an equal footing with other students and are included in the project groups when performing semester tasks.

Along with the basic programs the post-graduate students can study additional pedagogical courses for their choice in our university (more than 30 different additional programs) or outside the university.

Model of competence development of beginning academic staff and students of doctoral programs on the example of SBU in CR

Organizational basis of training. The key to the success of academic training in practice was organizational flexibility. This is ensured by the creation of training modules, which are flexibly selected and combined for the teachers involved, so that their design can be adapted to the individual needs of doctoral students as much as possible. Each PhD student implements those modules that correspond to his/her educational needs, either in terms of his/her identified potential in the area of pedagogical competencies, or in terms of the applicability of the acquired practical knowledge and skills in his/her own pedagogical activities. Within the selected modules, the doctoral student

may also set up blocks corresponding to his or her initial level of knowledge and skills and the required level of output, or blocks comprising specialized knowledge and skills corresponding to his or her current needs. Thus, the content of the courses is given individually according to the choice of the modules, while the content of the modules is determined by the individual choice of the modules or the choice of the individual level.

The organizational guarantor of the course should be the chair with university-wide activity, the appointed vice-rector responsible for continuous education should bear responsibility for the content and quality of educational activity. The course design is flexible, allowing for a flexible response to newly identified needs through the addition of new training modules or modules. The creation and assessment of the educational proposal is also based on the unified university concept of training academic staff in the field of pedagogical competencies.

The training offer is provided and promoted in such a way that each staff member or his/her supervisor can clearly identify the training needs regarding the competence of the teaching staff, and the relevant training modules are aimed at acquiring relevant knowledge and skills. The educational offer of the modules is presented and promoted on an ongoing basis with its expansion, in the form of e-mail offers addressed to the employees, through the means of presentation on the university website (<https://czv.jcu.cz/en>) and through the managers who can contact it, to recommend (based on the experience of the already implemented training). Volume (number of runs) of realization of individual modules depends on educational needs of participants of the course (demand) and current organizational possibilities.

In order to maintain the long-term and systematic nature of the study, a minimum hourly range of completed training is defined. After reaching it, a successful PhD student receives a certificate in the field of university pedagogy. A successful student is a PhD student who has successfully completed the training modules for a total of at least 80 hours, so it is generally expected that the student will complete at least 80 hours of training in an intensity that corresponds to the individual needs and possibilities and the current schedule of the educational activities. Theoretically, two weeks of intensive training (e.g., language courses) or two years of less intensive training may be considered. The length of individual modules is not standardized, but depends on the selection of appropriate modules, with individual modules having specific time requirements for individual training, participation and self-study.

In connection with the educational objectives (expected results of training), educational content (curriculum) and other organizational conditions (number of participants, time-space options, etc.) the following main organizational forms of training and their combinations are used:

- e-learning (online learning in LMS Moodle);
- blended learning (a combination of online and contact learning);
- group contact training (workshop, seminar, lecture);
- individual consultations (contact or remote);
- working independently using appropriate teaching aids (preparation for contact training, learning to deepen understanding of the subject studied by contact training);
- individual work (work on assignments in connection with contact training) with subsequent assessment.

Content characteristics of training. The structure of the educational modules represents the development of a model of professional and personal competencies of the university teacher. As already mentioned, students choose fields that they consider very necessary for their qualification. In practice, this means that some topics are predominantly chosen (especially language training), while others are not well received (especially personal and social development). However, there is indeed a risk that some young university teachers will be unilaterally trained. Therefore, the advisory and managerial role of managers or supervisors in doctoral studies with whom young scientists consult in their professional development is important. The created structure contains the following modules:

1. Self-reflection, self-evaluation, self-management and self-development, reflective approach to pedagogical work, individual analysis of educational needs.
2. Modern didactic technologies (training in a multimedia classroom, effective use of ICT in training, use of technical equipment of newly equipped classrooms, etc.
3. Enhanced learning methods and organizational forms of learning:
 - introductory block devoted to general issues of teaching methods (correlation of goals, content and methods) and applied psychology of teaching (perception, attention, learning, memory), emotions and will in the learning process, process, behavioral and constructive approaches to learning, cognitive and learning styles, etc.);
 - several separate blocks dedicated to the careful and practical mastery of selected methods and organizational forms of training (mixed learning and over-the-counter classroom, interpretation of tasks and presentation/presentation of the curriculum, practical training - demonstration

and instructing, group, joint and project-oriented training, simulations and case studies, discussion and development of critical thinking, reflection and self-expression, video training interaction, etc.).

4. Diagnostics and assessment: goals and results of training, methods of finding and evaluating learning results, providing feedback to students – formative and summary evaluation, concept of added value in education, evaluation of absolute and relative performance, etc.
5. Creation and use of activating exercises.
6. Establishment and administration of e-learning courses at university.
7. Creation, administration and publication of digital (interactive, activated) teaching aids and teaching materials in JU, multi-media and their use in mixed learning, etc.
8. Modern approaches to the curriculum: knowledge of didactic content, selection and didactic transformation of the curriculum, linking research and teaching, inclusion of new scientific knowledge in teaching, etc.
9. Management skills (project management, learning management, learning management, etc.)
10. Soft skills: pedagogical communication, rhetoric, motivational art – educational leadership, etc.
11. Skills of teaching English.

An integral part of individual modules is the issue of specific pedagogical work with pupils with special needs, respectively work with heterogeneous groups of students.

Model of training of doctoral students and young teachers at the HIIBE

Pedagogical training of doctoral students is not regulated separately in the PRC. “Doctoral training should give students the opportunity to master seriously and widely the basic theories in this field, systemic and deep specialized knowledge, relevant skills and methods, to get the ability to independently carry out in this field of science scientific research of innovation and practical work.”¹⁴ However, certain traditional regulations had been adopted which required the mandatory teaching of future university staff. As a rule,

¹⁴ *Education laws in the People's Republic of China*, p. 60.

https://spbu.ru/sites/default/files/zakon_ob_obrazovanii_v_kitayskoy_narodnoy_respublike_rus.pdf (13.02.2022).

masters combine post-graduate study with teaching. It is necessary to confirm or obtain pedagogical qualification. Teaching courses were compulsory for doctoral students who wished to become university teachers. It is possible to assert that mainly doctoral students in the PRC master the teaching tendencies in practice in combination with additional pedagogical courses. However, this does not mean that the process is spontaneous. There exists a specific regulation on training for teaching.

Organizational basis of training. Not all graduate programs include pedagogical training. More often, thematic courses are organized, which are more likely to be attributed to additional professional education. Lectures, workshops and trainings are organized according to the decision of the university administration. At the same time there is a practice of graduate students, which is not considered as a limited part of their educational program. It can last 3-4 years, the PhD students' work is paid, but doctoral students are not trusted to perform all professional functions. A list of requirements is developed for them, and systematic control of their teaching and educational work is conducted.

Content characteristics of training. Whether or not a regular course of pedagogy is given to doctoral students, their pedagogical education includes both theoretical and practical parts. Theoretical part is implemented by the university administration or dedicated teachers and consists in lectures, master classes and training for graduate students. At these events, postgraduate students are familiarized with:

- professional education policy (a number of national programs aimed at improving the quality of education in the context of the development of international trends in science, entrepreneurship and education (for example, the pedagogical concept of new engineering education in the field of technical translation, due to the growing number of joint engineering Russian-Chinese projects) is being actively implemented in PRC);
- internal regulations for the operation of universities (usually the Chinese university represents a campus, provided with all the necessary infrastructure, which operates a lot of internal regulations that relate not only to educational activities);
- the fundamentals of higher education;
- teaching methods.

In practice, doctoral students are not immediately admitted to teaching disciplines. At first, they work as group curators. Periods vary from 1 to 4

years. The post-graduate student usually supervises several student groups. The main type of pedagogical activity of the doctoral student is educational. Among the competencies of the curator of the group on educational work:

- familiarization of students with the rules of residence in the hostel (in China all students live in the hostel, even local students from the city where the university is located) and control over their implementation;
- support of the students' adaptation to educational activities and new living conditions;
- control of attendance;
- systematic interaction with students, their parents (if necessary), with a psychologist (if necessary);
- assistance in organization of extracurricular cultural, sports and other events.

During the pandemic, it was the education managers who shouldered the burden. During the quarantine, when there was a threat of an outbreak in the city of Qinhuangdao, the educational directors lived with the students in the hostel of the Institute for two weeks.

Curatorship in the field of educational work is practiced in organizations of higher education and in professional organizations of PRC. At the same time, there is tutorship in the field of educational activities (pedagogical assistance and control of students' educational activities), which is necessary for a future teachers' career development.

Individual and group forms of work with doctoral students prevail. This is especially true for universities with a small number of doctoral students. The emphasis is on interpersonal interaction; communication between doctoral students and teachers should not be formal, but rather confidential. The relative insularity of the campuses also contributes to this, especially during the pandemic, when the campuses became isolated from the rest of the world.

As is typical for doctoral studies, various (formal, informal, informal) types of education are used.

We discussed tree partly similar, partly different models of pedagogical training of the future academic staff of the universities. It should be noted that the models, which are implemented in individual regions of our countries, were given in detail. Reflecting the most common trends in teaching postgraduate (doctoral) students in our countries, they are not standardized options for working with postgraduate students in all universities of our countries.

5. CONCLUSIONS

The variants of preparation of post-graduate / doctoral students for future pedagogical activity are analyzed in the article. This contingent is expected to form the most qualitative part of the academic staff of the universities. Criteria of quality of the young part of academic staff in the university have been revealed on the basis of the methods of analysis of scientific literature and normative documents, the method of expert evaluations and surveys of students. It is substantiated that in order to solve strategic problems of higher education institutions and improve the quality of higher education in general, young academic staff should be targeted as the most capable personnel for solving actual university problems. In the article three models of pedagogical training of post-graduate students in universities of the Russian Federation, the Czech Republic and the Public Republic of China are offered. The variety of approaches to post-graduate training in the university, due to the combination of their formal education with informal and informal, does not allow to assert that these models are typical. At the same time, the trend towards the unification of global requirements for the quality of higher education and its staffing allows us to define the invariant features of teacher training of highly qualified specialists not only within the individual countries considered, but also at the global level.

1. The training of doctoral students as a reserve of academic staff of higher education is conditioned by the specifics of functioning and development strategies of modern universities.
2. Pedagogical training of personnel of higher qualification is organized in accordance with the normative defined criterion of evaluation of quality of personnel support of higher education in the world, country, university; they are defined as world tendencies of development of higher education, and strategic directions of development of individual universities.
3. The regulation of the pedagogical training of post-graduate (doctoral) students is regulated at the state and university levels.
4. The modules of pedagogical training of highly qualified personnel contain organizational and content components.
5. The implementation of pedagogical modules is carried out in the unity of theoretical and practical training; combines the execution of educational and professional (pedagogical) functions; synthesizes formal, informal and informational aspects of education; combines the use of various organizational forms and methods of education.

Sažetak:

KVALITETE PEDAGOŠKOG OSPOSOBLJAVANJA VISOKO KVALIFICIRANOG OSOBLJA

Svjetska sveučilišta započinju s kvalitativno novim pute razvoja u trećem desetljeću 21. stoljeća. Kako bi odgovorila na izazove, sveučilištima su potrebni aktivni mladi kadrovi, čime se aktualizira zadaća kadrovskog formiranja visokog obrazovanja u skladu sa suvremenim zahtjevima. Analizirano je svjetsko iskustvo u provedbi pedagoškog osposobljavanja za sveučilišta sposobna rješavati hitne probleme visokog obrazovanja u okviru programa osposobljavanja za visokokvalificirano osoblje (na primjeru Ruske Federacije, Češke i Narodne Republike Kine). Utvrđuju se nepromjenjiva obilježja kvalitativne pripreme doktoranada.

Ključne riječi: kvaliteta visokog obrazovanja, kadrovska popunjenost, izobrazba visokokvalificiranih kadrova.

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**APPLYING ISO 9001:2015 AND ISO 21001:2018
TO BE RECOGNIZED AS A STUDENT-CENTRIC
ORGANIZATION THROUGH VALUE-BASED
QUALITY EDUCATION – A CASE STUDY IN
VIETNAM**

PRIMJENA ISO 9001:2015 I ISO 21001:2018
USMJERENIH NA STUDENTE KROZ KVALITETU OBRAZOVANJA –
STUDIJ SLUČAJA U VIJETNAMU

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ABSTRACT

ISO recently published a new management system standard EOMS ISO 21001:2018. This standard outlines the requirements for educational organizations and is intended for such organizations than the more commonly used QMS ISO 9001:2015 quality management system. The education organization needs to establish implements maintains and continually improve an IMS including the processes needed and their interactions, in accordance with the requirements of standards. The education organization determines processes for the IMS and their application throughout the organization and determines the inputs required and the outputs expected from these processes; determines the sequence and interaction of these processes; determines and apply the criteria and methods needed to ensure the effective operation and control of these processes; determines the resources needed for these processes and ensure their availability; assigns the responsibilities and authorities for these pro-

cesses; address the risks and opportunities as determined in accordance with the requirements of 6.1 of ISO 21001:2018; evaluates these processes and implement any changes needed to ensure that these processes achieve their intended results; and improves the processes and the IMS. IMS Manual is used externally to introduce the elements of the EOMS & QMS to Interested Parties and other external organizations even to the extent necessary. We will present a case study has been applied on the implementation of IMS at the Education and Training Department of Son La Province. We recommend that educational organizations should be adopting integrated ISO9001:2015 and ISO 21001:2018 management systems.

Key words: ISO 9001:2015, quality management system, ISO 21001:2018, management system for educational organizations, The IMS Manual, IMS certification.

1. INTRODUCTION

The International Organization for Standardization (ISO) recently published a new management system standard ISO 21001:2018. This standard outlines the requirements for educational organizations and is intended for such organizations than the more commonly used ISO 9001:2015 quality management system. This paper aims to compare both standards and study their similarities and differences to evaluate whether the new standard is more suitable for educational organizations. After employing qualitative analysis to directly compare the two standards in terms of breadth, depth and terminologies, it was found that while both standards use the same high-level structure, ISO 21001:2018 is broader and deeper than ISO 9001:2015 with more-lower level clauses. The terms used in the new standard are also very specific for education such as learner, curriculum, courses, learning outcomes, assessment, grades, etc. In addition, it also acknowledges that the customers of education are actively involved in the process therefore intensive communication should be maintained. Observing these findings, we conclude that educational organizations should be better off adopting this new standard

Some examples and applications will be presented to support the theme of the proposal. Relationships between theory and practice will be clearly demonstrated. We analyze the fact of quality assurance system in some universities autonomy in Viet Nam. In which, proposing to build the quality assurance models to implement the initiative in university management and it increase their responsibilities to the government, students, and social. The model of quality assurance system in universities autonomy is compatible

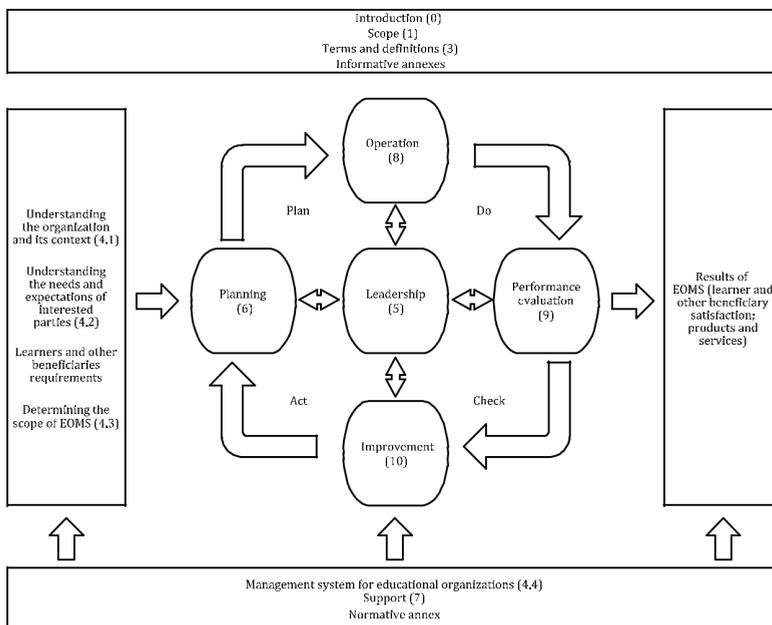
with QMS ISO 9001:2015 (Quality management system) and EOMS ISO 21001:2018 (Management system for educational organizations), national education standards as well as international standards.

2. EOMS IN THE FRAMEWORK OF ISO 21001:2018

The Plan-Do-Check-Act (PDCA) cycle can be applied to all processes and to the EOMS as a whole. Figure 1 illustrates how Clauses 4 to 10 can be grouped in relation to the PDCA cycle. The PDCA cycle can be briefly described as follows:

- **Plan:** establish the objectives of the system and its processes, and the resources needed to deliver results in accordance with learners’ and other beneficiaries’ requirements and the organization’s policies, and identify and address risks and opportunities;
- **Do:** implement what was planned;
- **Check:** monitor and (where applicable) measure processes and the resulting products and services against policies, objectives, requirements and planned activities, and report the results;
- **Act:** take actions to improve performance, as necessary.

Fig. 1. Structure of EOMS ISO 21001:2018 in the PDCA cycle



The Plan-Do-Check-Act (PDCA) cycle can be applied to all processes and to the EOMS as a whole.

3. PRINCIPLES FOR AN EMOS

This EOMS entails the following 11 management principles:

- focus on learners and other beneficiaries,
- visionary leadership,
- engagement of people,
- process approach,
- improvement,
- evidence-based decisions,
- relationship management,
- social responsibility,
- accessibility and equity,
- ethical conduct in education,
- data security and protection.

4. ORGANIZATION POLICY (VISION – MISSION – STRATEGY)

The EOMS policy statements are framed by the organization's culture (the complete set of beliefs and values that condition its behavior) and by the EOMS principles. In turn, the EOMS policy statements provide the framework for the establishment of the EOMS objectives, which are periodically revised to ensure the organization's mission is effectively and efficiently accomplished while walking the continuous path towards the achievement of the organization's vision. The articulation of these elements is usually called a strategy.

4.1. Developing the policy

Vision: Top management establishes, review and maintain an educational organization policy; To be recognized as a student-centric institute through value-based quality education.

Mission: Emerge as a remarkable facilitator for enhancing employability quotient of young graduates through business management education, which eventually contributes decisively to sustainable economic growth.

Strategic Goals:

- Endeavor to bridge the gap between Industry-Academic;
- Impart updated knowledge of business management through interactive research;
- Develop and Hone business acumen and managerial skills through a holistic approach;
- Provide a nurturing environment to foster the entrepreneurial spirit.

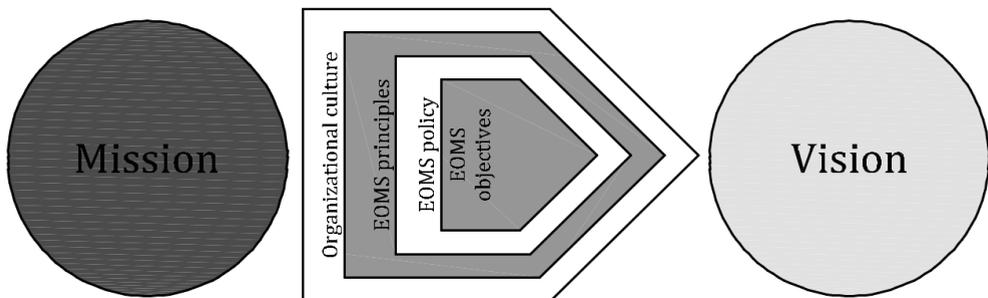
4.2. IMS Policy

The Organization is committed to a culture of redefining excellence and quality enhancement through a process of continuous quality improvement in all our endeavors comprises Teaching – Learning, evaluation, research, consultancy, and continuing education in order to development of well competent and resilient professionals and remain focused in incubation and promotion of entrepreneurial spirit, eventually contributing substantially to nation-building.

4.3. Communicating the policy

The educational organization policy is made available and maintained as documented information. It is communicated by display, training.

Fig. 2. EOMS strategy as related to mission and vision



It is ensured that it is understood and applied within the organization. It is made available to relevant interested parties, as appropriate.

5. ISO 9001 AND ISO 21000 IN EDUCATIONAL ORGANIZATIONS

ISO 9001 and ISO 21001 have numerous similarities and differences between both. This document is a stand-alone management system standard, aligned with ISO 9001. It focuses on the management systems of educational organizations as well as the impact of these on learners and other relevant interested parties. This document conforms to ISO’s requirements for management system standards. These requirements include a high-level structure, identical core text, and common terms with core definitions, designed to benefit users implementing multiple ISO management system standards. This document can be implemented alongside regional, national, open, proprietary and other standards or related documents.

Almost clauses of ISO 9001:2015 and ISO 21001:2018 is interacting and similarities. Key differences between ISO 9001:2015 and ISO 21001:2018 (see Table 1).

Table 1. The main differences between ISO 9001:2015 and ISO 21001:2018

Principles: ISO 9001 (7 Principles)	ISO 21001 (11 Principles)
Customer Focus	Focus on learners and other beneficiaries
Leadership	Visionary leadership
Engagement of People	Engagement of people
Process approach	Process approach
Improvement	Continual improvement
Evidence-based Decision Making	Evidence-based decisions
Relationship Management	Relationship management
	Accessibility and equity
	Ethical conduct
	Data security and protection
Main focus ISO 9001	Main focus ISO 21001
Focus on customer satisfaction	Satisfaction of learners and other beneficiaries (government, labour market, parents & guardians)

Table 2 illustrates clause to clause between ISO 9001:2015 Requirements and Additional/Specific/Different Requirements in ISO 21001:2018 and phase of P- D-C-A Cycle.

Table 2. Clause to clause: Additional requirements

ISO 9001:2015 Requirements	Additional/Specific/Different Requirements In ISO 21001:2018	Phase of P- D-C-A Cycle
0 Introduction	Principles of EOMS; EOMS Framework Vision, Mission, and Strategies	-
1 Scope	-	-
2 Normative Reference	-	-
3 Terms and Definitions	Education sector specific definitions	-
4 Context of Organization	Management system for educational organizations	Plan
5 Leadership	Focus on learners and other beneficiaries	
6 Planning	-	
7 Support	Additional requirements for special needs education	Do
8 Operations	Additional requirements for special needs education Protection and transparency of learner's data	
9 Performance Evaluation	Satisfaction of learners, other beneficiaries, and staff	Check
10 Improvement	-	Act
Annex A: Clarification of new structure, terminology, and concepts. Annex B: Other International Standards on quality management and quality management systems developed by ISO/TC 176	Annex A: Additional requirements for early childhood education Annex B: Principles for an EOMS Annex C: Classification of interested parties in educational organizations Annex D: Guidelines for communication with interested parties Annex E: Processes, measures, and tools in educational organizations Annex F: Example of mapping to regional standards Annex G: Health and safety considerations for educational organizations	Annexures

5.1. Why do integrating ISO 9001 and ISO 21001?

ISO 9001 is the international standard for a quality management system (QMS). In order to be certified to the ISO 9001 standard, a company must follow the requirements set forth in the ISO 9001 Standard. The standard is used by organizations to demonstrate their ability to consistently provide products and services that meet customer and regulatory requirements and to demonstrate continuous improvement; However, if ISO 9001 is applied to education, some problems may arise between the production environment and the educational environment. Therefore, we consider to integrate ISO 9001 and ISO 21001 will be an IMS (Integrated Management System) stronger and more efficiency in education.

ISO 21001 is based on Quality Management Systems ISO 9001, but it provides a specific framework for educational organizations that aim to enhance the satisfaction of their learners by improving the educational processes and ensuring conformity to learners requirements.

5.2. Who are the Benefits?

Requirements of ISO 9001 and ISO 21001 with guidance for use, is intended to meet this challenge by defining the requirements of a management system that will help education providers better meet the needs and expectations of their learners and other beneficiaries, and demonstrate greater credibility and impact. The new International Standard ISO 21001:2018 focuses on the specific interaction between an educational institution, the learner and other customers.

Educational organizations will benefit through delivering a more impactful and relevant learning experience that is aligned with the organization's own mission and vision. Learners will benefit even more because the education service they receive can be more personalized and suited to their needs, ultimately leading to better learning outcomes.

5.3. Key Benefits of Integrating ISO 9001 and ISO 2100

The potential advantages of the QMS and EOMS are: 1) Better arrangement of instructive objectives and activity plans; 2) Enable quality education for all; 3) Self-learning and deep-rooted learning openings; 4) Personalized learning and enhancements in a custom curriculum needs; 5) Consistent procedures and assessment instruments to build productivity; 6) Increased believability of the instructive association.

5.4. What are the business implications of ISO 9001 and ISO 21001 for the educational institutions?

- Adopting industry best practices and raising the nature of education;
- Increase consumer loyalty as making straightforwardness in learning administrations;
- Enhancing the focused capacity of administrations;
- Eliminate excess administrations from process and limit reputational and fiscal misfortunes;
- Continuous improvement through steady observing to improve learning forms Global perceivability and open trust by guaranteeing respectability and greatness of learning programs.

IMS (ISO 9001 and ISO 21001) makes accessible a complete arrangement of practices that are material to learning specialist co-ops. The ISO 21001 Certification will help construct strong training division and animates development and drives monetary development.

6. PRACTICAL TAKEAWAYS

A case study in the Education and Training Department of Son La Province found significant achievements resulting from IMS implementation (ISO 9001:2015 and ISO 21001:2018). When applying IMS, they found that the organization's operating mechanism is more stable and scientific. The quality of work has been significantly improved. Each member deeply understands his rights as well as his great responsibilities, his work is always "Kaizen" to suit the development trend of society. All departments followed commitments in quality objectives. The ultimate goal of the system is to improve the quality of educational management to contribute to the training of generations of 20k students who know how to work, to meet the requirements of the labor markets. Board of Directors and staffs were be controlled in documentation and transparency in the management more and more.

6.1. IMS Manual

This document articulates the Education and Training Department of Son La Province (short name: SONLA) commitment to quality and continuous improvement. It gives an outline of the key processes with reference to the policies and procedure that comprises SONLA Educational Organizational Management system (EOMS) & Quality Management System (QMS)

and provides a holistic and integrative view of the quality management of the organization.

SONLA adopts the Educational Organizational Management system (EOMS) & Quality Management System (QMS) across all the units belongs to SONLA. The implementation of the IMS is intended to improve and sustain the overall performance of business and services of the society as well as to enhance the satisfaction of learners, other customers and personnel through the effective application of its IMS. SONLA's IMS Manual is intended as a guide and reference document for all faculty and staff and should be read in conjunction with the SONLA's policies, regulations procedures, and associated documents which include, but are not limited to work instructions and guidelines.

The IMS Manual is used externally to introduce the elements of the EOMS & QMS to Interested Parties and other external organizations even to the extent necessary.

Table 3. The IMS Manual of the Education and Training Department of Son La Province and its Content

Sr.	Document No.	Description	Page (s)	Rev No	Rev Date
1.	---	Cover Page			
2.	IMS-M/01	Table of Contents			
3.	IMS -M/02	Amendment Details			
4.	IMS -M/03	Institute Profile			
5.	IMS -M/04	Context of Organization			
6.	IMS -M/05	Leadership			
7.	IMS -M/06	Planning			
8.	IMS -M/07	Support			
9.	IMS -M/08	Operation			
10.	IMS -M/09	Performance Evaluation			
11.	IMS -M/10	Improvement			
12.	Annex -1	Internal And External Issues – SWOT Analysis			
13.	Annex - 2	Needs and Expectations of the intersected Parties			
14.	Annex - 3	Process Input-Output Matrix			
15.	Annex - 4	Organization Chart			
16.	Annex - 5	Risk Assessment and Mitigation Plan			
17.	Annex - 6	Objectives/Goals and Action			
18.	Annex - 7	Communication Matrix			

 <p>PEOPLE'S COMMITTEE OF SON LA PROVINCE DEPARTMENT OF TRAINING AND EDUCATION 106 Thanh Nien – To Hieu Ward – Son La City – Son La Province Tel: 0212 3852 355 Fax: 0212 3852 355 Website: www.sogddtsonla.edu.vn</p>								
<p>IMS (INTEGRATED MANAGEMENT SYSTEM) MANUAL ISO 21001:2018 & ISO 9001: 2015 Standard</p>								
<p>Document No. : HD/9.3/BISO Issued time : 01 Issued valid date : 01/10/2020</p>								
Signature	Prepared by	Controlled by	Approved by					
Full name	Nguyen Dang Duong	Cam Van An	Nguyen Huy Hoang					
Title	IMS Secretary	QMR	General Director					
<p>This document is distributed to the following titles/units:</p> <table border="1" style="width: 100%;"> <tr> <td>Title/Unit</td> <td>Title/Unit</td> </tr> <tr> <td>ISO Management Board</td> <td>The subordinate units</td> </tr> </table> <p><i>This Manual is the property of the Department of Training and Education of Son La Province, is a controlled document. It may not be reproduced either in part or full without prior written permission of the Department.</i></p>					Title/Unit	Title/Unit	ISO Management Board	The subordinate units
Title/Unit	Title/Unit							
ISO Management Board	The subordinate units							

6.2. IMS Policy

Top management of SONLA has established, implemented and maintained an educational organization policy that:

- supports the educational organization mission and vision;
- is appropriate to the purpose and context of the organization and supports its strategic direction for conducting credible teaching;
- provides a framework for setting educational organization objectives;
- includes a commitment to satisfy applicable requirements including the requirements of ISO 21001:2018;
- includes a commitment to satisfy the organization's social responsibility;
- includes a commitment towards managing intellectual property;
- includes a commitment to continual improvement of the educational organizations management system.

The educational organization policy of SONLA see Table 4.

Table 4. Vision – Mission – Policy

	The Education and Training Department of Son La Province	ID Code: CS/5.2/BISO
		Issued time: 01
		Valid from: 01/10/2020
		Page/ Total pagers: 1/1

VISION - 2040

To build and develop Son La province into a center of education and training of quality, advanced, modern, international integration of the Northwest region, northern provinces of Laos and the whole country; creating a preminent and sustainable environment for all people to have equal access to education, promoting the province's socio-economic development in association with preserving and promoting the value of national cultural identity. .

MISSION

Building an educational environment for Virtue - Wisdom - Body - Beauty development to meet the requirements of national development and international integration. Develop synchronously and improve the quality and effectiveness of education and training at all levels. Promote the participation of the whole society with education and training.

POLICY - 2025

- 1. Manage and develop the education and training sector flexibly, adapting to the province's natural, socio-economic conditions. Building a learning society for the benefit of the community and society.*
- 2. Applying and transferring scientific and technological achievements in teaching and management, aiming at learners and meeting the needs of society.*
- 3. Continuously improve management methods of the Department, management methods and teaching and learning methods of schools; strengthen traditional education.*
- 4. Promoting all potentials, intelligence, dedication and social responsibility of all members of the education industry and interested parties, building a sense of discipline, close relationships with customers, family increase the quality of educational services to meet the human resource requirements of the society.*

Son La Province, 01 October 2020

DIRECTOR

Assoc. Prof. Dr. Nguyen Huy Hoang

6.3. Certification

ISO 21001 has been in development for nearly 5 years, having been first approved as a proposal in early 2014. Development of the standard has been undertaken by Technical Committee 288, which itself consist of 140 expert members from 44 participating countries, plus 14 ‘observer’ countries, led by the Korean Agency for Technology and Standards. A map of participation shows involvement of the UK and much of mainland Europe, Australia, Canada, and many South American and Asian countries.

Author of the paper made a survey research regarding the applying ISO 21001:2018 or Integrated Management System according to ISO 9001:2015 and ISO 21001:2018 in Asian countries. The results of this study will be announced and shared with the members of ANQ who participate in 2022ANQ Congress to be held in Beijing in October 2022.

Table 5. Educational organizations/institutes/academies certified ISO 21001:2018 in Asian countries

No.	Country	Names of Educational organizations/institutes/academies	
		Certified ISO 21001:2018	Certified IMS (ISO 9001:2015 and ISO 21001:2018)
1	China (2)	Shandong Institute of Commerce and Technology Qingdao Vocational and Technical College of Hotel Management	
2	India (20)/(20)	Sacred Heart International School Oakridge International School Oasis International School Aga Khan Educational Services Agarwal Vidhya Vihar, Surat Amity University, Gurugram Bharti Foundation Birla Public School, Pilani Bhartiya Vidya Bhavan Dubai Islamic Bank Delhi Public School Sheoran International School Indraprastha Institute Of Information Technology, Delhi Institute Of Management Studies, Ghaziabad Johnson Grammar School The National Institute Of Open School Panjab university Podar International School, Mumbai Ryan International Group of Institutions Sacred Heart School	Sacred Heart International School Oakridge International School Oasis International School Aga Khan Educational Services Agarwal Vidhya Vihar, Surat Amity University, Gurugram Bharti Foundation Birla Public School, Pilani Bhartiya Vidya Bhavan Dubai Islamic Bank Delhi Public School Sheoran International School Indraprastha Institute Of Information Technology, Delhi Institute Of Management Studies, Ghaziabad Johnson Grammar School The National Institute Of Open School Panjab university Podar International School, Mumbai Ryan International Group of Institutions Sacred Heart School
3	South Korea (6)	Inchon ea Univeristy, Shinhan University, Ajou University (Medical Division), Kongju University, Kyonggi University, Luther University	
4	Russia (2)/(2)	National Research University «Moscow Power Engineering Institute» (MPEI) Volgograd State University	National Research University «Moscow Power Engineering Institute» (MPEI) Volgograd State University
5	Taiwan (1)	Taiwan Agricultural Chemicals and Toxic Substances Research Institute	
6	Vietnam (1)/(1)	Department of Education and Trainig of Son La Province	Department of Education and Trainig of Son La Province
Total:		32 certified ISO 21001	23 certified ISO 9001 & ISO 21001

Source: Own research.

This survey explores the applicability of the process-based approach in the basic education sector as prescribed by ISO 21001:2018, ISO 9001:2015 and the PDCA model. The study intends to emphasize the need by the education sector to introduce a Quality Management system using a Process-based approach in teaching and learning processes.

7. CONCLUSION

The significant goal of ISO 9001:2015 and ISO 21001:2018 are to assess if the instructive needs of the students and different recipients are being met.

ISO 9001:2015 and ISO 21001 are valuable for a wide range of instruction suppliers. Extending from kindergarten to advanced education just as professional preparing and e-learning administrations. ISO 9001:2015 and ISO 21001:2018 are additionally pertinent to instructive branches of enormous associations, for example, departments of education and training.

By making available a comprehensive set of practices that are applicable to learning service providers across the board, ISO 9001:2015 and ISO 21001:2018 will help build a stronger education sector and provide positive knock-on effects in terms of stimulating innovation and the economy.

The new ISO 2001:2018 Standard is in accordance with the Plan-Do-Check-Act (PDCA) cycle, empowering associations to set up an educational management system.

Sažetak:

PRIMJENA ISO 9001:2015 I ISO 21001:2018 USMJERENIH NA STUDENTE KROZ KVALITETU OBRAZOVANJA – STUDIJ SLUČAJA U VIJETNAMU

ISO je nedavno objavio novu normu sustava upravljanja EOMS ISO 21001:2018. Ova norma opisuje zahtjeve za obrazovne organizacije i namijenjena je takvim organizacijama od češće korištenog sustava upravljanja kvalitetom ISO 9001:2015. Obrazovna organizacija treba uspostaviti implementaciju koja održava i kontinuirano poboljšava integrirani sustav upravljanja (ISU) uključujući potrebne procese i njihove interakcije, u skladu sa zahtjevima norme. Obrazovna organizacija određuje procese ISU i njihovu primjenu u cijeloj organizaciji te utvrđuju potrebne ulazne podatke i izlazne rezultate koji se očekuju od tih procesa; određuje slijed i međudjelovanje tih procesa; utvrđuje i primjenjuje kriterije i metode potrebne za osiguranje

učinkovitog rada i kontrole ovih procesa; utvrđuje resurse potrebne za te procese i osigurava njihovu dostupnost; dodjeljuje odgovornosti i ovlasti za ove procese; rješava rizike i prilike kako je utvrđeno u skladu sa zahtjevima 6.1 standarda ISO 21001:2018; ocjenjuje te procese i provodi sve potrebne promjene kako bi se osiguralo da ti procesi postignu željene rezultate; te poboljšava procese i ISU. Priručnik ISU se koristi za upoznavanje s elementima EOMS i sustava upravljanja kvalitetom zainteresiranim stranama i drugim vanjskim organizacijama u mjeri u kojoj je to potrebno. U radu se predstavlja primijenjenu studiju slučaja na implementaciji ISU-a u Odjelu za obrazovanje i osposobljavanje provincije Son La. Preporučuje se da obrazovne organizacije usvoje integrirani sustav upravljanja kojeg čine ISO 9001:2015 i ISO 21001:2018.

Ključne riječi: ISO 9001:2015 – sustav upravljanja kvalitetom, ISO 21001:2018 – sustav upravljanja za obrazovne organizacije, Priručnik integriranog sustava upravljanja, certifikacija integriranog sustava upravljanja..

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PRIMJENA PROCESNOG PRISTUPA U SUSTAVU OSIGURANJA KVALITETE U VISOKOM OBRAZOVANJU

APPLICATION OF PROCESS APPROACH IN QUALITY
ASSURANCE SYSTEM IN HIGHER EDUCATION

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SAŽETAK:

Procesni pristup zahtjev je koji norma ISO 9001:2015 postavlja pred organizacije koje implementiraju sustav upravljanja kvalitetom, a jedan od razloga za to je mogućnost jednostavnijeg i kvalitetnijeg upravljanja sustavom. Primjena procesnog pristupa zahtjeva identifikaciju i dokumentiranje svih procesa koji se odvijaju u organizaciji što može biti složena aktivnost, a organizacije koje ju provode mogu se susresti s izazovom vezanim uz otpor dionika promjenama koje zahtjeva implementacija procesnog pristupa. ESG standardi i smjernice prepoznaju procese u visoko školskim organizacijama i daju autonomiju organizacijama u oblikovanju sustava osiguranja kvalitete sukladno smjernicama bez da eksplicitno naglašavaju potre-

bu implementacije procesnog pristupa. Međutim, zbog sličnosti u nekim zahtjevima koje navodi norma ISO 9001:2015 i ESG standardi i smjernice, implementacija i primjena procesnog pristupa nameće se kao jedan od optimalnih načina osiguranja sukladnosti s postavljenim zahtjevima. Sukladno tome, cilj ovog rada prikazati je mogućnost primjene procesnog pristupa u unutarnjem sustavu osiguranja kvalitete visoko školskih organizacija.

Ključne riječi: ESG standardi i smjernice, osiguranje kvalitete, procesni pristup, kvalitetno upravljanje.

1. UVOD

Procesni pristup poslovanju jedno je od načela koje naglašava norma sustava upravljanja kvalitetom ISO 9001:2015.¹ Kao takav, procesni pristup zahtjeva jasno definiranje odgovornosti za svaki proces koji se odvija u organizaciji kao i jasno definiranje kontrola temeljem kojih će se kontrolirati odvijanje procesa, pravila koja determiniraju način na koji će se proces odvijati, ulaza i izlaza iz procesa te mehanizama koji će se koristiti za transformaciju u procesu.² Drugim riječima, procesni pristup omogućuje učinkovito i djelotvorno upravljanje sustavom, a upravljivost je, uz kompetentnost i dokumentiranost, jedna od karakteristika kvalitetno upravljanog sustava. S obzirom na to da se procesni pristup temelji na PDCA načelu, a koje podrazumijeva stalno poboljšavanje na temelju provedene evaluacije performansi procesa u prethodnom ciklusu, usvajanje procesnog pristupa može rezultirati povećanjem zadovoljstva zainteresiranih strana u prvom redu, a u drugom redu povećanjem kvalitete proizvoda i usluga. Razlog za to je upravljivost koja se postiže posredstvom procesnog pristupa pa proizlazi da je kvalitetan proizvod ili kvalitetna usluga posljedica kvalitetnog upravljanja.³

Ako se govori o sustavu upravljanja kvalitetom, implementacija procesnog pristupa je imperativ. Budući da je sustav upravljanja kvalitetom generički sustav koji se može implementirati u organizacije svih vrsta i veličina, jedno od područja u kojem implementacija procesnog pristupa može rezultirati povećanjem kvalitete upravljanja je visoko obrazovanje. Visoko obrazovanje kao takvo tj. ustrojstvo sustava osiguranja kvalitete visoko škol-

¹ ISO 9001:2015, Quality management systems – Requirements.

² Krešimir Buntak, Matija Kovačić, Bojan Premužić, *Upravljanje poslovnim procesima*, Sveučilište Sjever, Koprivnica, 2020.

³ Krešimir Buntak, Zdenko Adelsberger, Ana Trajković, Dejan Adelsberger, „Utjecaj upravljanja intelektualnim kapitalom na organizacijsku kompetentnost“, 2012.

ske organizacije zahtjev je koji postavlja ESG standard⁴ ali koji ne definira potrebu ustrojstva sustava upravljanja kvalitetom, a samim time i usvajanja načela koje naglašava sustav upravljanja kvalitetom. Drugim riječima, ESG standard u visokom obrazovanju ne stavlja imperativ implementacije procesnog pristupa.

S obzirom na važnost osiguranja kvalitete, primarno zbog prirode obrazovnog sustava tj. izgradnje kompetencija polaznika programa obrazovanja, učinkovit i djelotvoran sustav osiguranja kvalitete, ali i upravljanja kvalitetom, postaje imperativ. Osim toga, s rastom i razvojem, a koji podrazumijeva povećanje broja studijskih programa, povećanje broja zaposlenika, povećanje broja polaznika obrazovanja, kompleksnost upravljanja i izazov osiguranja zadovoljavajuće kvalitete s aspekta zadovoljenja ESG standarda i zahtjeva zainteresiranih strana postaje sve kompleksnije. Smanjena mogućnost upravljanja sustavom, a upravljanje podrazumijeva ostvarenje svih funkcija menadžmenta (planiranja, organiziranja, vođenja, upravljanja ljudskim resursima i kontrole) rezultira padom kvalitete usluge. Budući da institucije visokog obrazovanja trebaju prilagođavati svoje studijske programe posljednjim znanstveno-istraživačkim dostignućima u koja institucije trebaju biti uključene, imperativa osiguranja kompetencija polaznika tj. ispunjenja zahtjeva zainteresiranih strana uz osiguranje sukladnosti s ESG smjernicama i pozitivnim zakonskim propisima, cilj ovog rada je prikazati procesni pristup kao jedan od načina na koji organizacije u visokom obrazovanju mogu osigurati kvalitetu na temelju kvalitetnog upravljanja pomoću procesnog pristupa.

2. USTROJ SUSTAVA OSIGURANJA KVALITETE

Institucije visokog obrazovanja obvezne su osigurati sukladnost sa ESG standardima i smjernicama. ESG standardi i smjernice predstavljeni su 2005. godine prilikom uvođenja Bolonjskog procesa u visoko obrazovanje. Izrađene su kroz suradnju Europske organizacije za osiguranje kvalitete u visokom obrazovanju (ENQA) s Europskom udrugom sveučilišta (EUA), Europskim udruženjem institucija visokog obrazovanja (EURASHE) i nacionalnim savezom studenata Europe (ESIB).⁵ Temeljno obilježje izrađenih smjernica je fleksibilnost u primjeni koja omogućuje i daje autonomiju visoko školskim

⁴ AZVO, Standardi i smjernice za osiguravanje kvalitete na Europskom prostoru visokog obrazovanja (ESG), (2015).

⁵ Žirvko Kondić, Vinko Višnjić, Damir Mađerić, „Osiguravanje kvalitete visokog obrazovanja na primjeru Sveučilišta Sjever“, *Tehnički glasnik*, Vol. 9, No. 2, 2015, pp. 172-176.

institucijama u ustrojstvu i osiguranju sustava osiguranja kvalitete. ESG smjernice prihvaćene su odmah nakon predstavljanja 2005. godine, dok 2015. godine prolaze kroz reviziju.⁶ Potrebno je naglasiti kako uz smjernice unutar ESG postoje zahtjevi tj. standardi s kojima visoko učilišta mora osigurati sukladnost. Primjer za to je ESG točka 1. koja se odnosi na standard vezan uz unutarnje osiguranje kvalitete visokog učilišta unutar kojeg su definirani zahtjevi vezani uz definiranje politike kvalitete, usmjerenost prema studentu,⁷ itd. Nadalje, stvaranjem i usvajanjem ESG standarda i smjernica pojavljuju se dva nova koncepta, a to su autonomna sveučilišta i autonomne agencije vezane uz osiguranje kvalitete što je u konačnici rezultiralo povećanjem kvalitete obrazovanja, odnosno osiguranjem zadovoljavajućih kompetencija završenih i diplomiranih studenata na sveučilištima.⁸

ESG standardi i smjernice po svojem sadržaju pokrivaju tri temeljna područja, a to su nastava i odvijanje nastave, međunarodna suradnja, odnosno područje znanstveno-istraživačkog rada. Za sva tri područja definirane su smjernice i standardi, a sveučilišta imaju mogućnost stvoriti vlastiti sustav osiguranja kvalitete koji će unutar sebe imati implementirane smjernice koje definira ESG. U osnovi, ustrojeni sustav unutarnjeg osiguranja kvalitete treba pokrivati područja:

- Razvoja strategije sveučilišta i postupke kojima će se osigurati kvaliteta;
- Razvoj, pregled, odobravanje programa i pripadajućih kvalifikacija koje se stječu;
- Ocjenjivanje studenata;
- Osiguranje kvalitetnog nastavničkog kadra;
- Resurse koje studenti mogu koristiti za učenje i razvoj;
- Sustav informiranja unutar sveučilišta;
- Javno informiranje zainteresiranih strana.⁹

⁶ Zlata Dolaček-Alduk, Vladimir Sigmund, Sanja Lončar-Vicković, „Osiguranje kvalitete visokog obrazovanja u europskom obrazovnom prostoru“, *Tehnički vjesnik*, Vol. 15, No. 1, 2008, pp. 39-44.

⁷ AZVO, Standardi i smjernice za osiguravanje kvalitete na Europskom prostoru visokog obrazovanja (ESG), 2015.

⁸ Zlata Dolaček-Alduk, Vladimir Sigmund, Sanja Lončar-Vicković, „Osiguranje kvalitete visokog obrazovanja u europskom obrazovnom prostoru“, *Tehnički vjesnik*, Vol. 15, No. 1, 2008, pp. 39-44.

⁹ Žirvko Kondić, Vinko Višnjić, Damir Mađerić, „Osiguravanje kvalitete visokog obrazovanja na primjeru Sveučilišta Sjever“, *Tehnički glasnik*, Vol. 9, No. 2, 2015, pp. 172-176.

Ako se sagledaju načela unutarnjeg sustava osiguranja kvalitetom ona se mogu svesti na načelo sustavnosti, načelo procesnog pristupa, načelo uključivanja studenata, zadovoljstvo dionika, stalno poboljšanje i cjeloživotno obrazovanje.¹⁰ Spomenuta načela slična su načelima upravljanja kvalitetom prema normi ISO 9001:2015 s iznimkom da nije spomenuto načelo upravljanja odnosima što je od posebne važnosti ako se govori o uključivanju poslodavaca i partnerskih institucija, odnosno razvoj odnosa s istima.¹¹ S druge strane načela koja su ugrađena u ESG smjernicama naglašavaju odgovornost koju sveučilište ima s aspekta osiguranja kvalitete studijskih programa, ESG navodi kako su smjernice za unutarnje osiguranje kvalitete osjetljive na raznolikost studijskih programa, naglašavaju da se potiče razvoj kulture kvalitete te naglašavaju kako je neophodno, za uspostavu učinkovitog sustava osiguranja kvalitete, uzeti u obzir zahtjeve koje imaju studenti, društvo kao i svi ostali dionici.

Unutarnji sustav osiguranja kvalitete visoko školske organizacije zahtjeva periodičnu provjeru od strane nezavisnog tijela tj. agencije koja je zadužena za osiguranje kvalitete. No, uz periodične nezavisne provjere, ESG smjernice ne zahtijevaju provjeru koju provodi samo sveučilište, odnosno provođenje internog audita. Međutim, unatoč nedostatku smjernica vezanih uz interni audit, za provođenje internog audita razvijen je mehanizam u vidu tablica za provođenje samoevaluacije koji omogućuje provjeru stanja unutarnjeg sustava osiguranja kvalitete, ali i provjeru stanja sveučilišta u cjelini. No, provjera trenutnog stanja predstavlja kontrolu kvalitete što može značiti gubitak suštine sustava osiguranja kvalitete. Osim što visoko školska organizacija mora osigurati sukladnost sa zahtjevima ESG standarda, odnosno treba osigurati tj. uzeti u obzir smjernice za osiguranje kvalitete definirane u ESG, ono mora osigurati sukladnost sa zahtjevima pozitivnih zakonskih propisa, internih akata kao i ostalih pravila i zahtjeva koji su definirani od strane zainteresiranih strana i dionika. Velik broj zahtjeva i nedostatak mehanizama koji bi se mogli koristiti za upravljanje tj. osiguranje kvalitete uz potrebu praćenja trendova te poboljšanja studijskog programa može utjecati na kompleksnost upravljanja tj. smanjiti učinkovitost.

¹⁰ Ibid.

¹¹ ISO 9001:2015. Quality management systems – Requirements.

2.1. Kvalitetno upravljanje

Kvalitetno upravljanje sustavom podrazumijeva upravljanje po načelima koje definira norma sustava upravljanja kvalitetom ISO 9001:2015, odnosno načelima vodstva, upravljanja odnosima, fokusiranja na kupca, poboljšanja, procesnog pristupa, donošenja odluka na temelju dokaza te uključivanja ljudi. Primjena ovih načela, uz osiguranje sukladnosti sa zahtjevima sustava upravljanja kvalitetom, osnova je za kvalitetno upravljanje. No, osim potrebe osiguranja sukladnosti sa zahtjevima sustava upravljanja kvalitetom, kvaliteta upravljanja postiže se i kroz definiranje politika kojima se definira način obavljanja aktivnosti, odnosno definira se osnova za donošenje odluka i funkcioniranje sustava.

Ako se govori o karakteristikama kvalitetno upravljanih organizacija, one se mogu svesti na dokumentiranost, upravljivost i kompetentnost. Dokumentiranost se odnosi na stvaranje dokaza o provedenim aktivnostima (stvaranje zapisa), definiranje obrazaca, definiranje i dokumentiranje postupaka, radnih uputa kao i osiguranje dostupnosti istih dionicima procesa, kao i dokumentiranje svih procesa koji se odvijaju u organizaciji. Upravljivost se odnosi na sposobnost menadžmenta da upravlja sustavom, odnosno postojanje mehanizama u sustavu koji omogućuju upravljanje. Manjak upravljivosti može rezultirati rizikom od pojave nesukladnosti, odnosno entropijom sustava. Posljednja karakteristika, kompetentnost, odnosi se na postojanje specifičnih znanja i vještina, odnosno tehnike, tehnologije kao i općenito odnosa unutar organizacije, a koji omogućuju ispunjenje zahtjeva zainteresiranih strana.¹² Ako unutar sustava ne postoje upravljački mehanizmi tj. kontrolni mehanizmi koji su dokumentirani te ako sustav ne posjeduje kompetentne zaposlenike koji na raspolaganju imaju tehniku i tehnologiju podržanu organizacijom, mogućnost i kvaliteta upravljanja sustavom može opadati.

2.2. ESG smjernice i standardi i ISO 9001:2015

ESG smjernice predstavljaju osnovu za stvaranje unutarnjeg sustava osiguranja kvalitete. Jednako kao i sustav upravljanja kvalitetom prema normi ISO 9001:2015 temelje se na zahtjevima koji se mogu svesti na potrebu dokumentiranja, osiguranje potrebnih kompetencija zaposlenika, odnosno opremljenost prostora, potrebu revizije tj. kontrole odvijanja procesa koji se odvijaju unutar sveučilišta te provođenje aktivnosti poboljšanja. Drugim

¹² Krešimir Buntak, Zdenko Adelsberger, Dejan Adelsberger, „Kompetentnost – ključna karakteristika organizacije upravljane na načelima kvalitete,“ *Kvalitet*, 2011, pp. 7-8

riječima, postoje sličnosti koje su vidljive u načelima i zahtjevima sustava upravljanja kvalitetom, odnosno zahtjevima i smjernicama koje su definirane u ESG-u. Sličnosti se primarno očitavaju kroz potrebu osiguranja kompetentnih zaposlenika, potrebu osiguranja resursa za provođenje nastave, odnosno osiguranje infrastrukture i suprastrukture za odvijanje procesa, poboljšanja, povratne informacije studenata i poslodavaca, odnosno rješavanje žalbi.

Tablica 1. Komparacija zahtjeva ESG smjernica i standarda i ISO 9001:2015

ESG	ISO 9001:2015
1.7. Upravljanje informacijama	4. Organizacija i njezin kontekst
1.3 Učenje, poučavanje i vrednovanje usmjereni na studenta	5.1.2 Fokusiranje na kupca
1.1. Politika osiguranja kvalitete	5.2 Politika
	7.3 Svjesnost
1.5 Nastavno osoblje 1.6. Resursi i podrška studentima	7.1 Resursi 7.2 Kompetentnost
1.7. Upravljanje informacijama 1.8. Informiranje javnosti	7.4 Komuniciranje
1.7. Upravljanje informacijama	8.2 Zahtjevi za proizvode i usluge
1.9. Kontinuirano praćenje i periodička revizija programa 1.10. Periodičko vanjsko osiguravanje kvalitete	9. Vrednovanje performansi 10. Poboljšanje

Izvor: Prilagodili autori prema: ISO 9001:2015 *Quality management systems – Requirements* i AZVO, Standardi i smjernice za osiguravanje kvalitete na Europskom prostoru visokog obrazovanja (ESG), 2015.

U tablici 1 prikazana je komparativna analiza ESG standarda i smjernica vezanih uz unutarnje osiguranje kvalitete i zahtjeva sustava upravljanja kvalitetom. Evidentno je kako postoji sličnost u zahtjevima no potrebno je napomenuti kako norma ISO 9001:2015 postavlja značajno veće zahtjeve na sustav u odnosu na ESG. To je vidljivo kroz potrebu određivanja konteksta, a koji bi podrazumijevao analizu okolina sveučilišta, potrebu provođenja internog audita, sagledavanja rizika, definiranje i dokumentiranje procesa sa svim pripadajućim elementima knjige procesa, upravljanje znanjem kao i kroz potrebu osiguranja sukladnosti sa svim ostalim točkama koje nisu navedene u tablici 1. Sukladno tome, proizlazi zaključak da se načela i zahtjevi sustava

upravljanja kvalitetom prema ISO 9001:2015 mogu ugraditi tj. mogu se koristiti za nadogradnju zahtjeva koje definira ESG, a što znači, između ostalog, i mogućnost primjene načela upravljanja kvalitetom sadržanih u ISO 9001:2015.

3. PROCESNI PRISTUP U UNUTARNJEM OSIGURANJU KVALITETE SVEUČILIŠTA

Procesni pristup može omogućiti i stvoriti temelj za učinkovitije i djelotvornije upravljanje sustavom zbog mogućnosti jednostavnije kontrole, odnosno preventive mogućih nastanka nesukladnosti. Ako se govori o visokom obrazovanju, ESG standardi i smjernice prepoznaju procese unutar sveučilišta i naglašavaju važnost uključenosti zainteresiranih strana, odnosno naglašava potrebu da se politika kvalitete visokog učilišta implementira u sve procese koji se odvijaju unutar sveučilišnog sustava. Međutim, unatoč tome što ESG naglašava procese i njihovu važnost ne definira potrebu njihova dokumentiranja, a što podrazumijeva identifikaciju svih procesa koji se odvijaju unutar visoko školske organizacije te izradu knjige procesa.

S obzirom na smjernice i standarde koje naglašava ESG i na samu djelatnost visoko školskih organizacije, unutar takvih organizacija mogu se identificirati tri temeljna procesa povezana uz ESG, a to su nastavni proces, proces međunarodne suradnje i znanstveno-istraživački proces. Osim spomenutih temeljnih procesa, svaka visoko školska organizacija može imati niz potpornih procesa koji omogućuju učinkovito odvijanje temeljnog procesa, odnosno upravljačkih procesa koji omogućuju djelotvornost temeljnog procesa. Odvijanje spomenutih procesa determinirano je pravilima koje definira i donosi Zakonodavac, internim propisima i pravilnicima koje donosi visoko školska organizacija, odnosno normama od kojih se kao temeljna nameće ESG, uz mogućnost implementacije ostalih sustava upravljanja u ovisnosti o potrebi visoko školske organizacije.

Implementacija procesnog pristupa u visoko školsku organizaciju zahtjeva, u prvom redu, identifikaciju svih uključenih dionika, odnosno radnih mjesta, pravila i postupaka koji se primjenjuju u procesu, definiranje kontrolnih točaka koje moraju biti u sukladnosti s ESG smjernicama, Zakonima i pravilnicima kao i definiranje ulaza i izlaza iz svakog procesa. Ovakav pristup omogućuje jednostavniju implementaciju standarda i smjernica koje definira ESG, praćenje odvijanja procesa, a kao jedna od najvažnijih prednosti može se istaknuti da se radi o generičkom modelu koji je primjenjiv u

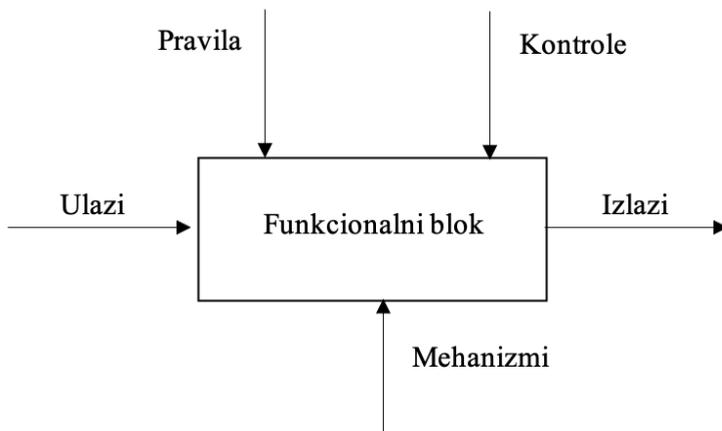
svim visoko školskim organizacijama uz prilagodbu kontekstu u kojem se organizacija nalazi. Nadalje, budući da je jedna od karakteristika kvalitetno upravljane organizacije upravljivost, a upravljivost se postiže kroz procesni pristup, visoko školska organizacija može stvoriti osnovu za povećanje učinkovitosti i djelotvornosti upravljanja. Samom identifikacijom procesa i definiranjem zahtjeva koji se postavljaju na proces stvara se osnova za definiranje kompetencija koje dionici procesa moraju zadovoljiti što dovodi do zadovoljenja druge karakteristike kvalitetnog upravljanja, kompetentnosti. Definiranjem i dokumentiranjem procesa, odnosno stvaranjem zapisa koji nastaju odvijanjem procesa zadovoljen je treći zahtjev, dokumentiranost. Ako se govori o zahtjevima vezanim uz stalna poboljšanja, budući da se procesni pristup temelji na PDCA, a po svojoj prirodi funkcionira na temelju povratne veze, povratna veza može biti osnova za definiranje poboljšanja u novom procesnom ciklusu.

Procesni pristup temelji se na međusobnoj povezanosti svih potprocesa koja omogućuje jednostavnu kontrolu izlaza tj. ulaza u proces. Drugim riječima, izlaz iz jednog potprocesa ulaz je u drugi potproces čime se osigurava provjera sukladnosti ulaza koji mora biti sukladan sa definiranom specifikacijom budući da potproces ne može započeti bez sukladnog ulaza. Na ovakav način stvara se imperativ osiguranja sukladnosti sa svim standardima, odnosno razvoj rješenja prema smjernicama koje definira ESG.

3.1. Dokumentiranje procesa

Dokumentiranje procesa postupak je u kojem se, nakon identifikacije, započinje s izradom knjige procesa čiji dijelovi ovise o metodi koja se koristi za dokumentiranje procesa. U osnovi, generička knjiga procesa sastoji se od definiranih radnih uputa, postupaka, matrice odgovornosti i prikazanog procesa procesa, odnosno pripadajućih potprocesa odabranom metodom dokumentiranja kao što je to IDEF0 metoda. Primjena IDEF0 metode u prikazivanju procesa sa sobom donosi prednost preglednosti svih ulaza, izlaza, mehanizama, pravila i kontrola u procesu, a čime se može stvoriti osnova za edukaciju svih dionika procesa o procesu i ulozi svakog dionika. Slika 1 prikazuje blok shemu IDEF0 metode s dijelovima procesa.

Slika 1. IDEF0 funkcionalni blok



Izvor: Prilagodio autor prema: Krešimir Buntak, Matija Kovačić, Bojan Premužić, *Upravljanje poslovnim procesima*, Sveučilište Sjever, Koprivnica, 2020.

Kao što je vidljivo na slici 1, proces prema IDEF0 metodi opisuje se:

- *Ulazima*: koji u kontekstu visokog obrazovanja mogu biti preporuke iz prethodnog ciklusa vrednovanja, zahtjevi dionika (studenata i nastavnika), zahtjevi tržišta rada (poslodavaca i preporuke strukovnih udruženja) i slično.
- *Mehanizmi*: predstavljaju sve resurse koji se koriste u procesu kao što su to zaposleni u nastavnom zvanju, zaposleni u znanstveno-nastavnom zvanju, računalna i druga oprema, prostor, obvezna i dopunska literatura i slično.
- *Pravila*: odnose se na zahtjeve koje definira ESG, odnosno zahtjeve koje postavlja Zakonodavac, zahtjeve definirane odlukom visokog učilišta i slično.
- *Kontrole*: odnose se na način evaluacije, odnosno mjerenja rezultata koje zahtjeva ESG ili drugi propis, odnosno politika.
- *Izlazi*: predstavljaju završene ili diplomirane studente i slično.

3.2. Procesni pristup i osiguranje kvalitete

Primjena procesnog pristupa u osiguranju kvalitete omogućuje jednostavnije osiguranje sukladnosti sa standardima koje definira ESG, odnosno jednostavniju prilagodbu smjernicama zbog same prirode procesnog pristu-

pa koja zahtjeva kontinuitet u praćenju performansi. Drugim riječima, kroz stalne kontrole i analizu performansi omogućuje se stvaranje osnove za poboljšanja, odnosno kroz oblikovanje sustava osiguranja kvalitete pomoću procesnog pristupa omogućuje se stvaranje sljedivosti u dugom roku što je posebno značajno s aspekta periodične vanjske provjere koju provodi neovisna agencija. Osim toga, zbog primjene kontrolnih točaka i stvaranje zapisa o provedenim aktivnostima, kroz provođenje internog audita stvara se osnova za poboljšanje sustava, kao i ostvarenje stalne komunikacije a vanjskim dionicima i zainteresiranim stranama, što naglašava ESG.

Nadalje, primjena procesnog pristupa u unutarnjem sustavu osiguranja kvalitete visoko školske institucije omogućuje upravljanje svim procesima i njihovim međusobnim odnosima kao sustavom, što rezultira djelotvornijim i učinkovitijim ostvarenjem ciljeva kvalitete u organizaciji, povećava sposobnost usmjeravanja organizacijskih napora na ključne procese i identifikaciju prilika za poboljšanje, omogućuje racionalno korištenje dostupnih resursa u organizaciji kao i što stvara povjerenje zainteresiranih strana u organizaciju, a vezano uz dosljednost, djelotvornost i učinkovitost.¹³

4. ZAKLJUČAK

Primjena procesnog pristupa u sustavu unutarnjeg osiguranja kvalitete visokog učilišta donosi prednost bolje mogućnosti kontrole nad procesima u organizaciji kao i mogućnost jednostavnijeg osiguranja sukladnosti sa zahtjevima koji su definirani ESG standardima i smjernicama. Implementacija procesnog pristupa može zahtijevati radikalne promjene u načinu funkcioniranja sustava što može rezultirati pojavom otpora dionika uključenih u proces. Međutim, nakon implementacije, procesni pristup može osigurati učinkovitije i djelotvornije upravljanje ali i veće zadovoljstvo zainteresiranih strana. Osim toga, implementacija i primjena procesnog pristupa omogućuje povećanje kvalitete upravljanja sustavom zbog čega je implementacija i dokazivanje procesnog pristupa obveza svih organizacija koje imaju implementiran i certificiran sustav upravljanja kvalitetom prema normi ISO 9001:2015. Budući da je u ovom radu kroz komparaciju dokazana sličnost u zahtjevima norme ISO 9001:2015 i ESG standarda i smjernica, procesni pristup se nameće kao optimalan način ostvarenja sukladnosti sa ESG-om.

¹³ ISO 9001:2015, Quality management systems – Requirements.

Abstract:**APPLICATION OF PROCESS APPROACH IN QUALITY ASSURANCE SYSTEM IN HIGHER EDUCATION**

Process approach is a requirement that the ISO 9001: 2015 standard imposes on organizations that have implemented a quality management system, and one of the reasons for this is the possibility of simpler and better management of complex systems. Applying a process approach requires identifying and documenting all processes that take place in the organization, which can be a complex activity, and organizations that implement it may face the challenge of stakeholder resistance to change required by implementing a process approach. ESG standards and guidelines recognize processes in higher education organizations and give autonomy to organizations in designing quality assurance systems in accordance with standards and guidelines without explicitly emphasizing the need to implement a process approach. However, due to the similarity in the requirements specified by ISO 9001: 2015 and ESG standards and guidelines, the implementation and application of the process approach is imposed as one of the optimal ways to ensure compliance with the requirements. Accordingly, the aim of this paper is to present the possibility of applying a process approach in the internal quality assurance system of higher education organizations.

Key words: ESG standards and guidelines, quality assurance, process approach, quality management.

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PRIMENA PARETO DIJAGRAMA U SPORTU

APPLICATION OF PARETO DIAGRAM IN SPORT

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SAŽETAK

Pareto (ABC) dijagram je grafička metoda za analizu pojava u kojim se vrši rangiranje veličina/pojaava ili grešaka i njihovih uzroka u opadajućem redosledu. Može se primeniti u sportu gde je moguće identifikovati problem i na osnovu dobijenih rezultata analize poduzimati korektivne aktivnosti za njihovo otklanjanje. Rad daje smernice za korišćenje Pareto dijagrama za efektivno određivanje uticajnih faktora i njihove veličine u oblasti sporta.

Ključne riječi: Pareto dijagram, sport, studija slučaja.

1. UVOD

*Pareto princip kaže da se 80% rezultata postiže sa 20% vremena (i obrnuto).¹ Ovaj princip je već primenjen na mnoge oblasti i principe života, a može se veoma uspešno primeniti i na sport. Jedan klasičan primer principa 80-20 je *McDonalds*, koji je prepoznao da najveći deo svog profita dolazi od hamburgera i pomfrita. U sportu skoro svi profesionalni timovi (prva i*

¹ <https://www.functionalpathtrainingblog.com/2011/02/the-pareto-principle-8020-rule-applied-to-coaching.html>

druga liga... čak i ispod!) koriste sistem za prikupljanje podataka o učinku sportista. Statistika je najbolji način da se to uradi. Kada se uradi analiza planova za trening, može se reći da se pola planiranog vremena lako potroši na zagrevanje, kao i za neke “omiljene vežbe“. Većina rezultata dolazi iz malog procenta rada. Koliko je kritičnih 20% u igri? 80% rezultata dolazi od 20% igrača. Princip 80-20 je primenljiv na svaki aspekt igre i može pomoći da se poveća efikasnost i da se postigne što bolji rezultat. Neke vrste treninga ili metode mogu i doprineće više od drugih. Izazov je pažljivo proceniti šta raditi u implementaciji treninga kako bi se utvrdilo gde se dobija najveći rezultat. Omiljena vežba ili vežba za koju se misli da funkcioniše, možda to ne radi ono što se misli da radi, i nije mesto odakle dolaze rezultati.

2. OSNOVE PARETO DIJAGRAMA

Pareto pravilo kaže da, za mnoge događaje, otprilike 80% efekata dolazi od 20% uzroka. Ovo je prvi put primetio italijanski ekonomista *Vilfredo Pareto*, koji je još 1906. godine zapazio da 80% zemljišta u Italiji poseduje 20% populacije. U praksi naravno ne mora uvek apsolutno da važi pravilo 80-20, već približno mogu i ovi odnosi: 75-25, 70-30 i sl.

Tabela 1. Pravilo 80/20 & 20/80

PRIMERI 80/20	PRIMERI 20/80
80% profita neke komp. dolazi od 20% klijenata	20% vaše garderobe nosite 80% vremena
80% reklam. u nekoj komp. dolazi od 20% klijenata	20% farmera proizvodi 80% svetske poljoprivrede
80% prodaje neke komp. dolazi od 20% proizvoda	20% hrane uzrokuje 80% povećanja telesne težine
80% vašeg uspeha dolazi iz 20% vaših ideja	20% vaših TV kanala se gleda 80% vremena
80% prodaje je od 20% klijenata	20% ljudi u vašem životu troši 80% vašeg vremena
80% vašeg znanja se koristi 20% vremena	20% akcionara poseduje 80% akcija korporacije
80% stresa je uzrokovano 20% stresora	20% vaših navika stvara 80% vaše produktivnosti
80% bogatstva je u vlasništvu 20% stanovništva	20% ljudi proizvodi 80% inovacija
80% saobrać. na web lok. dolazi od 20% sadržaja	20% prof. sportista uzrokuje 80% prodaje karata
80% mišićne mase se gradi sa 20% ponavljanja	20% stanovnika Zemlje izaziva 80% svetskih problema
80% izostanaka komp. je uzrokovano 20% osoblja	20% opasnosti na radu proizvodi 80% povreda
80% koristi od bilo kog proizvoda ili usluge može se obezbediti uz 20% cene	20% vašeg znanja se koristi 80% vremena
80% tržišta snabdeva 20% dobavljača	20% zaraženih ljudi prenosi 80% bolesti
	20% odeće spakovane u kofer nosi se 80% vremena

Izvor: Izradio autor.

Ovo pravilo se pokazalo istinito za mnogo pojave u prirodi i u društvu. Kasnije je ovo pravilo izraženo pomoću dijagrama u cilju analize problema ili klasifikacije određenih kategorija. Postoji veći broj manje značajnih uzroka i manji broj značajnijih uzroka. Pareto diagram predstavlja grafičku prezentaciju podataka sa ciljem da se uoče i utvrde prioritetni problemi:

- pojave koja se proučava, prikazuju se na horizontalnoj osi u opadajućem nizu važnosti;
- učestanost pojave izražene u jedinicama ili učešće u ukupnom broju pojava (%), prikazuje se na vertikalnoj osi;
- identifikuju se najznačajniji uzroci za posmatranu pojavu;
- dijagram se upotpunjuje izlomljenom linijom kumulativne učestalosti koja se koristi da prikaže kumulativni doprinos pojedinih uzroka u proučavanim pojavama i završava se na 100%.

Primeri upotrebe Pareto dijagrama:

- u oblasti kvaliteta (greške, mane, nedostaci, žalbe, vraćeni proizvodi, popravke ...),
- u okviru analize troškova (gubici, planirani troškovi, vanredni troškovi, ...),
- u oblasti bezbednosti (nezgode, povrede, stradanja ...).

3. KORACI PARETO DIJAGRAMA/PRIMER: PRODAVNICA SPORTSKE OPREME

KORAK 1. Identifikacija problema koji je potrebno rešiti, sakupljanje i organizacija podataka

- U ovom koraku se odlučuje koju vrstu pojave ili problema treba istražiti (npr. koliko koji proizvod učestvuje u ukupnoj zaradi od svih proizvoda).
- Određuje se vremenski period za koji će se podaci analizirati (npr. protekla godina: podaci se uzimaju iz izveštaja za taj period).
- Prikupljaju se potrebni podaci, vrši se njihova kategorizacija (npr. 10 grupa proizvoda).
- Vrši se izbor jedinice mere koja će biti kriterijum za analizu (npr. zarada, znači koji deo ukupne zarade donose koji proizvodi).
- Uzimaju se podaci za jediničnu zaradu po svakom proizvodu i podaci o broju proizvedenih komada svakog proizvoda, da bi njihovim množenjem dobili ukupnu zaradu od svake vrste proizvoda (grupe) – to je veličina jedinice mere u ovom primeru.

KORAK 2. Kreiranje tabele

- Tabela prikazuje sve podatke i njihove pojedinačne i kumulativne sume, procentualne vrednosti i kumulativne procenete.
- Formira se: kolona sa grupama proizvoda; kolona sa brojem komada svake grupe;
kolona sa jediničnim zaradama – tj. zaradama po komadu i kolona sa ukupnom zaradom po proizvodu (pomnoži se broj proizvoda sa jediničnom zaradom).
- Kada se saberu svi redovi iz te nove kolone dobija se ukupna zarada (svih proizvoda zajedno), koja se upisuje na dnu kolone (EUR 311,700 iz tabele).
- U poslednjoj koloni se izračuna koliko ukupna zarada po proizvodu procentualno učestvuje u ukupnoj zaradi svih proizvoda zajedno (znači za grupu 1: $6,7\% = 21.000 \times 100/311.700$). I tako za svaku grupu.

Tabela 2. Prikaz osnovnih podataka i njihovih pojedinačnih i kumulativnih suma, procentualne vrednosti i kumulativne procenete

Grupa/Vrsta	Broj komada	Zarada po momadu (EUR)	Ukupna zarada po proizvodu (EUR)	Ukupna zarada (%)
1	2	3	4	5
1 (šorts)	6,000	3,5	21,000	6.7
2 (ranac)	1,800	3,0	5,400	1.7
3 (dukserica)	9,000	4,5	40,500	13.0
4 (dres)	6,900	5,0	13,800	4.5
5 (kapa)	5,300	1,5	7,950	2.7
6 (patike)	6,800	13,0	88,400	28.3
7 (ten.lopta)	3,000	1,0	3,000	0.9
8 (koš.lopta)	6,500	3,5	22,750	7.3
9 (trenerk)	7,800	12,0	93,600	30.0
10 (fud.lopta)	3,400	4,5	15,300	4.9
UKUPNO:	55,500		311,700	100,00

Izvor: Izradio autor

Nakon kreiranja tabele, potrebno je grupe podataka urediti po veličini, i to u opadajućem nizu.

Tabela 3. Prikaz grupe podataka po veličinu u opadajućem nizu

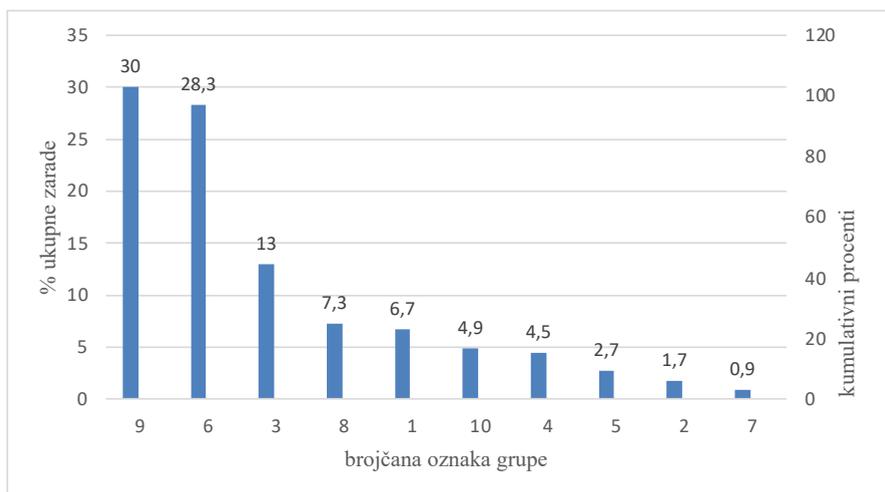
Grupa	Ukupna zarada po proizvodu (EUR)	Ukupna zarada (%)
9	93,600	30.0
6	88,400	28.3
3	40,500	13.0
8	22,750	7.3
1	21,000	6.7
10	15,300	4.9
4	13,800	4.5
5	7,950	2.7
2	5,400	1.7
7	3,000	0.9
Σ	311,700	100,00

Izvor: Izradio autor

KORAK 3. Konstruisanje koordinatnog sistema za Pareto dijagram

U ovom koraku se oblikuju dve vrste dijagrama i to: dijagram uticaja i dijagram relativnog kumulativnog uticaja. U primeru, oba dijagrama se spajaju u jedan (dve vertikalne i jedna horizontalna osa).

Grafikon 1. Dijagram uticaja i dijagram relativnog kumulativnog uticaja

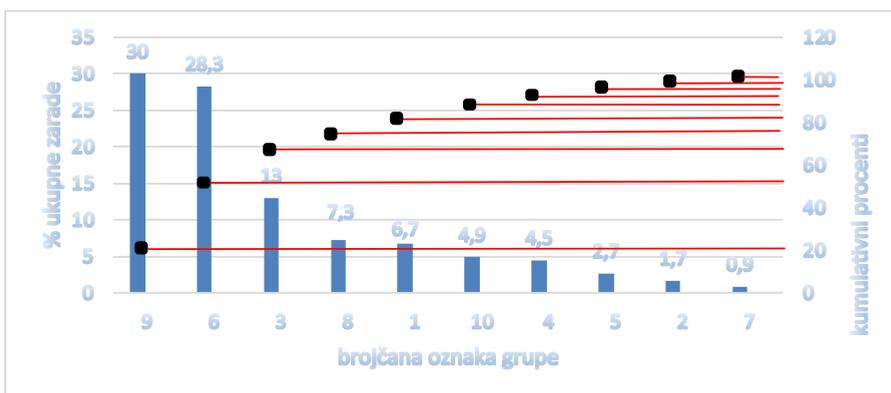


Izvor: Izradio autor.

KORAK 4. Konstruisanje kumulativne (Pareto) krive

Sada je potrebno oblikovati kumulativnu liniju uticaja, sabiranjem veličina % učešća (uticaja) za svaki uzrok ili grupu uzroka skupa. Gledamo desnu osu. Za prvu grupu na dijagramu tj grupu 9, vrednost procenta u odnosu na ukupnu zaradu je 30%. I ucrtavamo tu tačku. Za sledeću grupu, 6, procenat je 28,3%. Sada tih 28,3% sabiramo sa 30 (28,3+30=58,3%) i taj broj povežemo sa grupom 6 i dobijemo drugu tačku. Sledeća je grupa 3 sa procentom 13%, i za treću tačku sabiramo 13+58,3=71,3%. Sledeća je grupa 8 sa procentom 7,3%, i za četvrtu tačku sabiramo 7,3+71,3=78,6%. Sledeća je grupa 1 sa procentom 6,7%, i za petu tačku: 6,7+78,6=85,3%. Sledeća je grupa 10 sa procentom 4,9%, i za šestu tačku: 4,9+85,3=90,2%. Sledeća je grupa 4 sa procentom 4,5%, i za sedmu tačku: 4,5+90,2=94,7%. Sledeća je grupa 5 sa procentom 2,7%, i za osmu tačku: 2,7+94,7=97,4%. Sledeća je grupa 2 sa procentom 1,7%, i za devetu tačku: 1,7+97,4=99,1%. Sledeća je grupa 7 sa procentom 0,9%, i za desetu tačku: 0,9+99,1=100%.

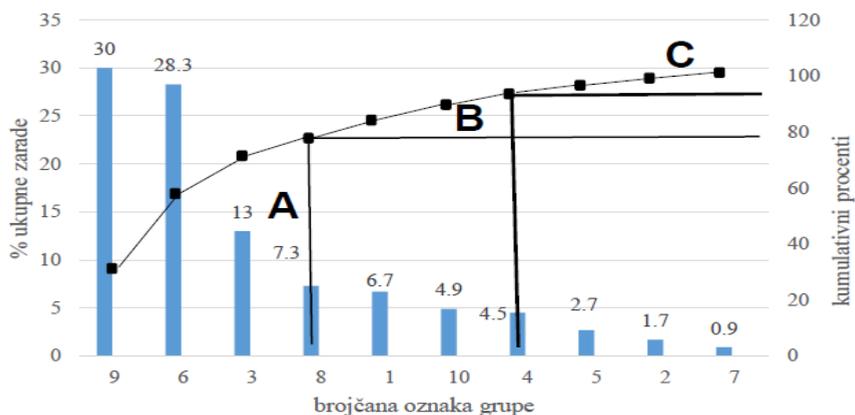
Grafikon 2. Konstruisanje kumulativne (Pareto) krive



Izvor: Izradio autor.

Kroz tačke provučemo krivu i to je *Pareto kriva*.

Grafikon 3. Pareto kriva

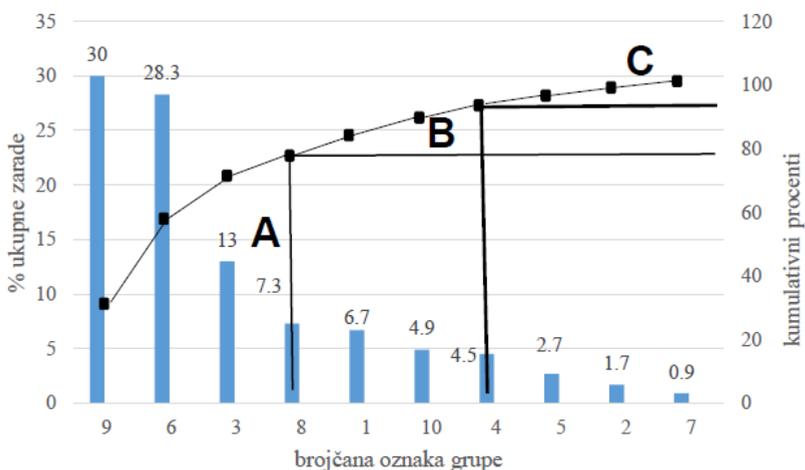


Izvor: Izradio autor.

Pareto dijagram se još naziva i ABC dijagram zato što omogućava izdvajanje: (a) grupe veoma uticajnih svojstava i karakteristika – područje A, (b) grupe uticajnih svojstava i karakteristika – područje B, (c) grupe manje uticajnih svojstava i karakteristika – područje C.

Povlačenje granica na dijagramu vrši se tako da: grupa A obuhvata 70-80% kumulativnog iznosa, grupa B, pridružena grupi A, obuhvata 90-95% kumulativnog iznosa, a grupa C obuhvata preostali dio kumulativnog iznosa, a to je 5-10%.

Grafikon 4. Opšti prikaz ABC dijagrama



Izvor: Izradio autor.

Određujemo A, B i C oblasti dijagrama. Granice oblasti mogu biti različite, u ovom primeru ćemo uzeti 80%, 15% i 5%. Povlačimo liniju od 80% na levoj vertikalnoj osi, do krive. Tamo gde linija preseče krivu spuštamo novu liniju do horizontalne ose. To isto radimo i sa 95% (80+15), i sa 100% (95+5). Iz dijagrama možemo videti da tri grupe proizvoda (9, 6, 3 i deo 8) donose 80% ukupne zarade, dok naredne dve grupe proizvoda (1, i deo 2) donose 15%. Poslednje tri grupe (5, 2 i 7) učestvuju sa samo 5% u ukupnoj zaradi.²

4. PARETO DIJAGRAM U SPORTU

(1) Studija slučaja: Golf. Golf je poznat kao četvrti najbogatiji sport na planeti. Od 385 golfera na *PGA* turneji za igrače golfa u 2015, *Jordan Spieth* ima najveću zaradu. Kao i *Spieth*, postoji nekoliko onih koji imaju veoma visoke zarade, ali oni su u manjini (npr. *Jason Day*, *Bubba Watson*, *Rickie Fowler*, *Dustin Johnson*, *Justin Rose*, *Rory Mcilroy*). Postoje neki igrači golfa koji zarađuju razumnu sumu, a zatim prezasićenost igrača golfa nižim zaradama. Najboljih 20% (77 igrača golfa) zajedno je zaradilo \$ 218 milona, što je 68% ukupne zarade. Preostalih 80% (308) igrača golfa podelilo je između sebe preostalih \$ 101 milion.³

(2) Studija slučaja: Jockey. Iako je zarada daleko manja nego u golfu, još uvek vidimo sličan obrazac - *Irish National Hunt Jockey* (sve vrste trka) za sezonu 2014-2015. *Ruby Walsh* je na vrhu liste od 152 džokeja. *Brian Cooper*, *Jonathon Burke*, *Paul Tavnend* i *Paul Carberry* takođe igraju veoma dobro. Najboljih 20% (30) džokeja podelilo je između sebe EUR 18.78 miliona. To je 78% kolača. Ovo je ostavilo samo EUR 5.2 miliona zarade za ostala 122 džokeja.

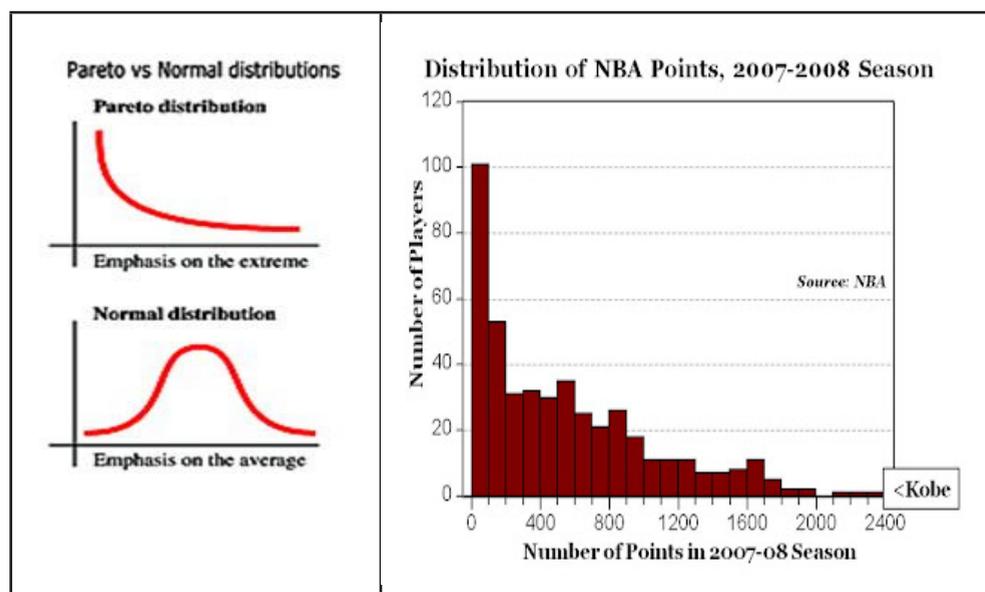
(3) Studija slučaja: Košarka. Uz hokejašku *NHL*, bejzbol *MLB* i ligu američkog fudbala *NFL*, *NBA* liga, jedna je od četiri profesionalne sportske lige u SAD. Košarka je statistički sport. Sve na podu se može izmeriti. Poeni, skokovi, asistencije, blokade, ukradene lopte, procenat udaraca, minuta, itd. Najmanje akcije i akcije igrača se pažljivo proučavaju. Pareto princip je izuzetno efikasan i prikazuje da polovina svih pobednika ide samo nekolicini odabranih timova. *Boston Celtics* i *Los Angeles Lakers* osvojali su po 17 puta *NBA* ligu. *Golden State Warriors* i *Chicago Bulls* osvojali su po 6 puta *NBA* ligu. Ovi podaci potvrđuju Pareto princip 80-20. Za *NBA* sezonu 2007-

² http://ie.mas.bg.ac.rs/data_store/upload/27_prezentacija_druge_vezbe.pdf

³ <https://www.sportseconomics.org/sports-economics/the-pareto-distribution-in-sport>

2008, bilo je ukupno 245.811 poena koje je postiglo 450 igrača. Najboljih 20% strelaca (predvođenih #1 *Kobe Bryant* sa 2.323 poena) imalo je 195.420 poena, ili 79,50% od ukupnog broja poena, što je skoro savršen primer Pareto distribucije. Baš kao i prihod ili bogatstvo, bodovi u *NBA* ligi su nejednako raspoređeni, a prirodan je ishod (Pareto raspodela) da 20% igrača postigne 80% poena.⁴ Konkretno, generalno, oko 80% pobeda tima proizvedu tri najbolja igrača tima”. Košarkaški trener, može da koristi Pareto dijagram da odredi kojih 20% tima doprinosi 80% pobeda i da svoje vreme i napore usmeri na poboljšanje tih igrača. *Chicago Bulls* osvaja *NBA* ligu zahvaljujući trojici igrača (*Michael Jeffrey Jordan*, *Scottie Maurice Pippen* i *Dennis Rodman*) i nekim zdravim odlukama koje je donosio glavni trener *Phill Jackson*. *Netflix* serijal ne navodi da li je *Phill Jackson* koristio Pareto dijagram da donese kritičnu odluku da usmeri svoje trenerske napore na *Jordana*, *Pippena* i *Rodmana*. Ali pretpostavimo da je to odigralo ulogu u uspehu *Chicago Bulls*.

Grafikon 5. Pareto distribucija postignutih poena, *NBA*, sezona 2007/2008



Izvor: www.aei.org/carpe-diem/top-20-of-nba-players-scored-80-of-total-points/

Pareto zakon (pravilo 80-20) se može primeniti na koji način se može efikasnije koristiti vreme na treningu. Koliko je 20% vremena kada je

⁴ <https://www.aei.org/carpe-diem/top-20-of-nba-players-scored-80-of-total-points/>

produktivnost najveća, ili koliko je tačno vremena izgubljeno i nije efikasno. To podstiče trenera da analizira kako se vreme provodi sa timom u praksi, i kako se ta praksa manifestuje u rezultatima, poznatim kao: performanse igre. Koliko je vremena izgubljeno? **Zašto? Koja** je svrha određenih vežbi? **Kako** se to manifestuje na igru? **Kada** bi se to desilo u igri? **Ko** je uključen u vežbu? **Gde** se ovo uklapa u poboljšanje konkretnog igrača? Ako se uradi prava analizu potrošenog vremena, shvatiće se da postoji mnogo suvišnih vežbi i elemenata koji kada se posmatraju objektivno, ne prenose se na rezultate. Mnogi treneri bi mogli da “objasne“ prednosti svojih dugogodišnjih “omiljenih vežbi“.

(4) **Studija slučaja: Baseball.** Proverom igrača bejzbola iz glavne lige prethodnih 10-tak godina putem WAR (sistem koji pokazuje koliko igrač donosi runova, bilo napadački ili odbrambeno, najčešće kombinovano, ekipi u odnosu na svoju zamenu), **15%** svih igrača je ostvarilo **85%** ukupnih pobeda, dok je ostalih **85%** igrača ostvarilo **15%** pobeda. Bejzbol ima svoje velike zvezde koje stvaraju najveći deo rezultata (*Mike Trout, Clayton Kershaw, Andrew McCutchen, Buster Posey, Giancarlo Stanton, ...*), zatim igrače koji ne doprinose mnogo, ili igrače koji zapravo nemaju rezultate.⁵

(5) **Studija slučaja: Fudbal.** U fudbalu navijačima je uvek veoma interesantno da posmatraju statistiku koja se odnosi na golove, asistencije itd. S obzirom na ogromnu moć nekih igrača u glavnim evropskim ligama (pre svega *Cristiano Ronaldo* i *Lionel Messi*), pitanje ovog puta bilo je da li je ova pojava čak i matematički opravdana. Gledajući vizuelizaciju kreiranu u ovom trenutku, možemo istaći kako je 20% igrača uspelo u sezonama 2017. i 2018. da postigne ukupno 35/40% golova. Raspodela golova među najboljim strelcima velikih fudbalskih liga je očigledno mnogo manje nego što kaže pretpostavka Pareto analize. Ipak, na prvih 20 turnira Svetskog kupa učestvovalo je 77 država, a samo su tri države (Brazil, Nemačka i Italija) pobedile 13 od ukupno 20.

5. ZAKLJUČAK

Sportisti i sportski radnici koji razmišljaju 80/20 dobri su u postizanju uspeha. Treba izabrati zadatke sa najvećim rezultatom i sa najmanje truda. Rešiti probleme uklanjanjem prepreka, kao npr., što je svetska mreža uradila uklanjanjem udaljenosti, ili kao što su restorani brze hrane to učinili uklanjanjem konobara. Uraditi više sa manje, ne više sa više. Sumnja,

⁵ <https://www.beyondtheboxscore.com/2010/6/4/1501048/applying-the-parento-principle-80>

odlaganje i preterana analiza troše energiju. Fokusirati se na vrednost, a resurse koji imaju slabe efekte treba zanemariti. Uspešni ljudi identifikuju vrednost i prilagođavaju se svetu. Razviti sposobnost mentalne blokade donjih 80%. Preplavljeni smo vremenom. Upravljanje vremenom nije problem. Problem je korišćenje vremena. Većina genijalnog posla se obavi za relativno kratko vreme. Postignuće je vođeno uvidom i selektivnim delovanjem.⁶

Abstract:

APPLYCATION OF PARETO DIAGRAM IN SPORT

Pareto or ABC chart is a graphical method for analyzing phenomena in which the ranking of size / or occurrence of errors and their causes in descending order. It can be applied in sports where it is possible to identify the problem and to the results of analysis take remedial action for their elimination. This paper gives guidelines how to use Pareto diagram effectively in determination of influential factors in sports.

Key words: Pareto diagram, sport, case study

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SUSTAVI MENTORIRANJA KAO PODRŠKA KVALITETI OBRAZOVANJA

MENTORING SYSTEMS AS SUPPORT TO
THE QUALITY OF EDUCATION

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SAŽETAK

Na Fakultetu agrobiotehničkih znanosti Osijek prepoznat je sustav za osiguranje kvalitete kao temeljni uvjet za stvaranje integriranog europskog prostora visokog obrazovanja. Sukladno tome na Fakultetu se prati kvaliteta izvođenja nastave, provode se istraživanja i anketiranja studenata i nastavnika o izvođenju nastave, nastavnim sadržajima, uvođenju novih pristupa i oblika izvođenja nastave, kompetencijama, komunikaciji s nastavnicima, informiranosti studenata o studijskom programu, izvođenju nastave te radnom opterećenju studenata. Upravo je uloga mladih i obrazovanih sudionika u agrarnom sektoru velika te je zbog loše demografske strukture u ruralnom prostoru neophodno ulagati u ljudske resurse. Kako bi se povećala zapošljivost završenih studenata ali isto tako i uočila važnost agrarnog sektora u nacionalnoj ekonomiji potrebno je implementirati sustave mentoriranja koji bi mogli osnažiti i pospješiti znanja i vještine studenata na tržištu rada. U radu predstavljena tri sustava mentoriranja (mentor-nastavnik; mentor-student; men-

tor-poslodavac) u različitim fazama djelovanja i provedbe na Fakultetu. Cilj rada je analizirati i argumentirati obrazovno iskustvo studenta temeljeno na znanstvenim i stručnim dostignućima kroz individualni pristup mentoriranja te predložiti daljnje smjernice razvitka.

Ključne riječi: kvaliteta obrazovanja, sustavi mentoriranja, Fakultet agrobiotehničkih znanosti Osijek, zapošljivost.

1. UVOD

Učinkovitost obrazovanja ovisi o kvaliteti nastavnog procesa, stručnosti i entuzijazmu nastavnika, ali isto tako i sustavima institucijske podrške, odnosno okruženja u kojem student djeluje. Thompson i suradnici¹ istaknuli su da je socijalna komponenta učenja jednako važna kao i kognitivna komponenta, te se ta dva elementa ne bi trebala odvajati dok studenti pokušavaju učiti. Sustav institucijske podrške je ključna komponenta koja čini zaokruženi proces. Informacijske i komunikacijske znanosti bave se fenomenima koji su dinamični, kompleksni te vrlo često interdisciplinarni, te su popraćene značajnim razvojem tehnologije.² Naime, uloga digitalizacije poprima sve značajniju i neizostavnu ulogu.

Sustav osiguranja kvalitete na Fakultetu agrobiotehničkih znanosti Osijek temelji se na misiji, viziji i postavljenim strateškim ciljevima, Strategiji Sveučilišta Josipa Jurja Strossmayera u Osijeku 2011.-2020. i Strategiji obrazovanja, znanosti i tehnologije Republike Hrvatske. Na Fakultetu prepoznat je sustav za osiguranje kvalitete kao temeljni uvjet za stvaranje integriranog europskog prostora visokog obrazovanja. Budući da je nastavni proces temeljni proces na Fakultetu, a objedinjuje i transferira znanje nastavnog kadra studentima, prenoseći najnovija znanstvena i stručna dostignuća, uočena je nužnost uvođenja i kontinuiranog razvoja sustava osiguranja i unaprjeđenja kvalitete. Sukladno europskim smjernicama, a paralelno s provođenjem Bolonjskog procesa, Fakultet aktivno djeluje u razvoju kulture kvalitete kroz uspostavu i poboljšanje sustava osiguranja kvalitete na temelju Zakona o osiguravanju kvalitete u znanosti i visokom obrazovanju (NN 45/09), Standarda i smjernica

¹ Celia Thompson, Kathleen Gray, Hyejeong Kim, „How social are social media technologies (SMTs)? A linguistic analysis of university students’ experiences of using SMTs for learning,“ *The Internet and Higher Education* 21, 2014, pp. 31-40.

² Tihana Babić, *Promjena komunikacijske paradigme u visokom obrazovanju pod utjecajem društvenih medija*, doktorska disertacija, University of Zagreb, Faculty of Humanities and Social Sciences / Sveučilište u Zagrebu, Filozofski fakultet, 2021.

za osiguranje kvalitete u Europskom prostoru visokog obrazovanja (ESG) iz 2015. godine, Pravilniku o ustroju i djelovanju sustava za osiguranje kvalitete na Sveučilištu Josipa Juraja Strossmayera u Osijeku, Pravilniku Centra za unaprjeđenje i osiguranje kvalitete visokog obrazovanja, Priručniku sustava za osiguranje kvalitete kao i ostalim propisima vezanim za sustav kvalitete.

Najvažniji pokazatelji kod istraživanja kvalitete visokoškolske ustanove su pokazatelji lojalnosti i zadovoljstva studenata. „Zadovoljstvo i lojalnost studenata uvelike ovise o kvaliteti usluga koje se pružaju.“³ Lojalan i zadovoljan student pomaže razvoju te visokoškolske ustanove. Zadržavanje lojalnosti i zadovoljstva studenata nije moguće bez provođenja sustava kvalitete na toj visokoškolskoj ustanovi.⁴ Kako bi se osigurali visoki standardi kvalitete obrazovanja i znanstveno istraživačkog rada te međunarodna prepoznatljivost Fakulteta, sustav za kvalitetu realiziran je unutar definiranog i transparentnog pravnog i organizacijskog okvira s trajnom svrhom promicanja visokih standarda profesionalnog i stručnog razvoja dionika u svim područjima djelovanja.

Cilj rada je identificirati i analizirati sustave mentoriranja koji predstavljaju podršku kvaliteti obrazovanja u različitim fazama djelovanja i provedbe na Fakultetu, te predložiti daljnje smjernice razvitka koje bi djelovale na učinkovitost obrazovanja koja bi se reflektirala na dominantniji utjecaj diplomiranih studenata na tržištu rada.

2. MATERIJAL I METODE

Većim dijelom u radu su primijenjene sekundarne baze podataka, odnosno relevantna literatura, zakoni i strategije na nacionalnoj i sveučilišnoj razni, a sukladno europskim smjernicama osiguranja kvalitete u visokom obrazovnom sustavu. Neke činjenice i zaključci proizašli su iz dugogodišnje analize sustava za osiguranje kvalitete na Fakultetu agrobiotehničkih znanosti Osijek, Sveučilišta Josipa Jurja Strossmayera u Osijeku, odnosno provedbom mjernih instrumenata koji su bili namijenjeni studentima, nastavnicima, mentorima, poslodavcima i slično.

³ Leyla Temizer, Ali Turkyilmaz, „Implementation of student satisfaction index model in higher education institutions“, *Procedia - Social and Behavioural Sciences*, 46, 2012, pp. 3802-3806.

⁴ Adis Puška, Aleksandar Maksimović, Samira Fazlić, „Utjecaj kvalitete na zadovoljstvo i lojalnost studenta“, *Poslovna izvrsnost*, Vol. 9, No, 2, 2015, str. 101-118.

3. REZULTATI I RASPRAVA

U cilju osiguranja kvalitete studiranja za svaku studijsku godinu Fakultetsko vijeće, na temelju prijedloga Povjerenstva za osiguranje kvalitete, imenuje voditelje/mentore kroz studij, koji imaju stalni kontakt sa studentima i upoznati su s eventualnim problemima koje prosljeđuju Povjerenstvu. Imenovanje voditelja/mentora kroz studij obavlja se s početkom akademske godine. Mentori dolaze iz reda nastavnog osoblja i redovito održavaju sastanke s grupama studenata ili izravnom individualnom komunikacijom sa studentom. Nastavnici mentori Povjerenstvu za osiguranje kvalitete dostavljaju izvješća do kraja akademske godine (rok za predaju je 30. rujna). Povjerenstvo za osiguranje kvalitete izrađuje godišnje izvješće o mentorskom sustavu. Izvješće čini analiza podataka dobivenih iz mentorskih izvješća i analiza rezultata provedene ankete. Izvješće Povjerenstva za osiguranje kvalitete o mentorskom sustavu sadrži preporuke za unaprjeđenje kvalitete mentorskog sustava za čije je provođenje zadužena uprava Fakulteta te se usvaja na Fakultetskom vijeću. Tablica 1. prikazuje pregled i provedbu sustava mentoriranja po pojedinim oblicima (mentor-nastavnik; mentor-student; mentor-poslodavac).

Tablica 1. Provedba sustava mentoriranja na Fakultetu agrobiotehničkih znanosti Osijek

SUSTAVI MENTORIRANJA			
	MENTOR-NASTAVNIK	MENTOR-STUDENT	MENTOR-POSLODAVAC
Početak provedbe	2015.	2021.	-
Broj mentora	9	-	-
Uključenost studenata	1.200	-	-

Izvor: Autori.

Provedba sustava mentoriranja MENTOR – NASTAVNIK provodi se od 2015. godine. Uključuje sve studijske godine i smjerove. U okviru mentorskoga sustava održani su sastanci svakoga mentora unutar studijske godine za koju je zadužen. Teme sastanaka su prilagođene studijskim godinama te se sukladno potrebama tržišta i novim organizacijskim i administrativnim obvezama prilagođavaju studentima. Odaziv studenata na mentorske sastanke je oko 80%. Godišnja izvješća o mentorskom sustavu prezentiraju se na Fa-

kultetskom vijeću. Preporuka je održavati 4 mentorska sastanka tijekom akademske godine po studijskoj godini. U sklopu mentorskog sustava organiziraju se radionice namijenjene studentima („*Pravila i oblici citiranja pri pisanju završnih i diplomskih radova*“, „*Kako se predstaviti poslodavcu*“, „*Izrada motivacijskog pisma*“, „*Kako učiti*“, „*Kako napisati životopis*“), gdje je angažiran stručan kadar prilagođen skupini studenta, odnosno studijskoj godini. Kroz mentorski sustav studenti su upoznati s oblicima mobilnosti, ali i s drugim aktivnostima koje se provode na Fakultetu.

Na Fakultetu agrobiotehničkih znanosti Osijek sustav MENTOR – STUDENT pokrenut je tijekom 2021. godine, a u potpunosti će zaživjeti tijekom ljetnog semestra akademske godine 2021/2022. Sustav je osmišljen tako da se studenti, potencijalni mentori prijavljuju na natječaj, te će sukladno svojim kompetencijama biti izabrani za studenta mentora. Osnovni zadatak studenta mentora je da svojim iskustvom stečenim tijekom studiranja, kolegama studentima mlađih generacija olakšaju sve aspekte studentskog života. Područja u kojima se očekuje najveća podrška studenata mentora je u povećanju uspješnosti studiranja i prilagodbi bruceša na nove životne uvjete. Student mentor dužan je tijekom akademske godine održati četiri sastanka s dodijeljenom skupinom studenata i o održanim sastancima voditi evidenciju, kako bi se na kraju akademske godine mogla napraviti evaluacija rada studenta mentora. Osim toga, student mentor će s dodijeljenim studentima uspostaviti odgovarajući način komunikacije (Viber grupa, mail, telefon), te im biti na raspolaganju za sva pitanja koja se tiču studija i studiranja, organizacije i rada Fakulteta te ostalih tema prema potrebama studenata. O provedenim savjetovanjima će također voditi evidenciju. Uz to student mentor će biti poveznica između studenata i mentora voditelja studentskih godina, odnosno nastavnika jer se očekuje da će studenti lakše i češće tražiti savjet i pomoć svojih vršnjaka. Na kraju akademske godine studenti će anketnim upitnikom ocijeniti rad studentskih mentora, a prikupljeni podatci će se analizirati i koristiti za poboljšanje provedbe navedenog sustava. Kroz ovakav sustav, student mentor će razvijati svoje komunikacijske vještine, organizacijske sposobnosti i stvarati nova prijateljstva. Stečene kompetencije će se kao izvannastavne aktivnosti studentu mentoru upisati u dopunsku ispravu o studiranju. Sličan sustav vršnjačke potpore uspješno se provodi na više fakulteta u Republici Hrvatskoj (Fakultet za menadžment u turizmu i ugostiteljstvu Sveučilišta u Rijeci, Odjelu za etnologiju i antropologiju Sveučilišta u Zadru, Medicinski fakultet Sveučilišta Josipa Jurja Strossmayera u Osijeku), a njihova iskustva i primjeri dobre prakse će se koristiti u provedbi sustava STUDENT - MENTOR Fakultetu.

Sustav MENTOR – POSLODAVAC ne provodi se direktno pod ovim nazivom iako ima inačice koje su povezane sa stručnom praksom studenata. Stručna praksa na Fakultetu odvija se i za studente preddiplomskog studija (na 3. godini) i studente diplomskog studija (na 2. godini). Stručna praksa traje 10 dana. Tijekom obavljanja stručne prakse studenti su dužni evidentirati svoje aktivnosti, tehnološke postupke, agrotehničke mjere, procedure, analitičke metode, izrade dokumenata i evidencije, ovisno o vrsti aktivnosti koju obavljaju, i upisati ih na odgovarajući način u dnevnik stručne prakse za svaki dan obavljanja stručne prakse. Dnevnik stručne prakse osobno popunjava student, a svojim potpisom ovjerava tehnolog ili voditelj prakse imenovan od strane poslodavca. Stručna praksa ima definirane ishode učenja na razini predmeta i obavezna je provjera postizanja predviđenih ishoda popunjavanjem ankete poslodavaca o stručnoj praksi. Anketom poslodavac odgovara o stupnju zadovoljstva sa studentima Fakulteta na praksi, ocjenjuje njihovo znanje i kompetencije na praksi i izjašnjava se koje bi kompetencije trebalo nadopuniti. Studenti prije donošenja dnevnika rada popunjavaju anketu studenta o stručnoj praksi u kojoj ocjenjuju zadovoljstvo vlastitim praktičnim znanjem stečenim na praksi, vlastitu osposobljenost za obavljanje prakse, znanje i kompetencije potrebne za obavljanje prakse i treba li povećati udio prakse kroz studij. Anketu obrađuje Ured za unapređenje i osiguranje kvalitete visokog obrazovanja, a rezultati ankete se sustavno objavljuju na mrežnim stranicama Fakulteta i služe za analizu uspješnosti studijskih programa.

Ovaj sustav treba biti izrazito dominantan i provediv jer je on ključan element u transferu studenta ka zapošljivosti na tržištu rada. Dualni sustav obrazovanja prepoznat je u mnogim europskim visokoškolskim ustanovama. Prema autorima Florijan Barišić i Rybacka Barišić⁵ načelo dualnog obrazovanja svjetski je poznato po svojoj sposobnosti da tržištu rada osigura visokokvalificiranu radnu snagu koja se može prilagoditi novim i promjenjivim uvjetima i uvođenju novih tehnologija. Osim toga, kvalificirana radna snaga obrazovana putem sustava dualnog obrazovanja ima vrlo visoku mobilnost na tržištu rada. Dualno obrazovanje osigurava čvrste veze između obrazovnog sustava i tvrtke i zbog sudjelovanja tvrtke u obrazovnim procesima. Upravo iz tih razloga kombinacija teorije i prakse je neophodna, ne samo kako bi se povećala zapošljivost završenih studenata, već kako bi se uočila važnost, kvaliteta i učinkovitost agrarnog sektora u nacionalnoj ekonomiji.

⁵ Anton Florijan Barišić i Rybacka Joanna Barišić, „Primjena dvojnog stručnog obrazovanja i osposobljavanja za poduzetništvo u svijetlu iskustva iz Poljske,“ *Education for Entrepreneurialship - E4E, International Journal of Education for Entrepreneurialship*, European Business School, Zagreb, Vol. 9, No 2, 2019, str. 176-187.

Ovaj pristup je dugoročnog karaktera i ovisi o stupnju razvijenosti i organiziranosti pojedine zemlje. Formalizacija obrazovanja te njegovo usustavljivanje ima svoju dugu povijest, te Šundalić ⁶ analizira mijenjanje svrhe obrazovanja koje je uvjetovano očekivanjima društva na različitim razinama razvijenosti, a posebice u vremenu informacijsko-inovacijske stvarnosti koja je društvu donijela nove vrijednosti.

Prema autorima Marković i sur.⁷ pandemija uzrokovana koronavirusom potaknula je brze promjene u obrazovnom sustavu, odnosno nastavu na daljinu i učenje, uključujući prilagodbu novim tehnologijama, obuku nastavnog osoblja u digitalnom obrazovanju i planiranje lekcija korištenjem e-platформи. I sustavi mentoriranja prilagodili su se tim trendovima. Korak dalje otišli su autori Gutai i sur.⁸ koji proučavaju inteligentne mentorske sisteme (eng. *Intelligent Tutoring System*, ITS) koji predstavljaju računalne programe koji su dizajnirani da simuliraju ponašanje predavača ili mentora uz pomoć tehnike umjetne inteligencije. Kako bi se kreirali mentori koji znaju što predaju, koga podučavaju i na koji način je potrebno predavati, definiran je virtualni mentor kao presjek tri područja: računarstva, kognitivne psihologije i obrazovnih istraživanja. Ova tri područja dio su kognitivnih znanosti. Međutim iako je digitalizacija neizostavan dio poslovnog djelovanja i napretka, čovjek je ipak središte i upravljač životnih procesa. Autori Oberman, Peterka i sur.⁹ naglašavaju kako je osposobljavanje pojedinaca za preuzimanjem odgovornosti za svoje obrazovanje, karijeru i život, odnosno osposobljavanje pojedinaca za poduzetnički pristup životu ključan element. Ekonomska sigurnost pojedinca ovisit će o njegovoj sposobnosti za učenjem i sposobnosti za snalaženjem u novim uvjetima rada. Kako bi opstali u decentraliziranim i racionalnijim organizacijama, pojedinci trebaju preuzeti inicijativu i odgovornost za vlastito učenje i kontinuirano usavršavanje svojih vještina. Kao rezultat poduzetničkog obrazovanja ljudi bi trebali djelovati spontano poduzetnički, u svim životnim situacijama.

⁶ Antun Šundalić, *Obrazovanje i društveni razvoj*, Rasprava o društvenom vrednovanju obrazovanja, (monografija), Svjetla grada, Osijek, 2015, 2015.

⁷ Monika Marković, Tihana Sudarić, Marija Ravlić, Željko Barač, „Challenges in teaching and learning in higher education during the COVID-19 crisis,“ case study, XXVII Skup *Trendovi razvoja* „On line nastava na univerzitetima“, Novi Sad, 2021, str. 99-102.

⁸ Andrea Gutai, Ivana Spasojević, Anđela Milićević, Danilo Nikolić, Aleksandra Kolak, „The application of intelligent tutoring systems (ITS) in distance education,“ XXVII Skup *Trendovi razvoja* „On line nastava na univerzitetima“, Novi Sad, 2021, str. 173-176.,

⁹ Sunčica Oberman Peterka, Anamarija Delić, Julia Perić, „Poduzetničko obrazovanje – put ka stvaranju zapošljivih i konkurentnih mladih ljudi“, *Praktični menadžment*, stručni časopis za teoriju i praksu menadžmenta, Vol. 7, No 1. 2016, .str. 23-27.

5. ZAKLJUČAK

Na Fakultetu agrobiotehničkih znanosti Osijek, sustav kvalitete se razvija duži niz godina i postaje sastavni dio redovnih aktivnosti Fakulteta te raspolaže dobrom materijalnom osnovom i kadrovskim resursima, odnosno visoko učilište je prihvatilo politiku osiguranja kvalitete, a realizira se provedbom strategije. Interni sustav osiguranja kvalitete uključuje sve dionike visokog učilišta (studente i vanjske dionike – poslodavce, alumnije, predstavnike strukovnih i profesionalnih udruženja).

Mentorski sustav (mentor-nastavnik) koji na Fakultetu djeluje od 2015. godine pruža potporu studentima, kako u postizanju akademskih ciljeva, tako i u razvoju vještina i kompetencija potrebnih za ostvarivanje vlastitih potencijala, profesionalnih i osobnih. Mentorski sustav promiče uvažavanje studentskih mišljenja i preporuka a koje bi bile u korist dvosmjerne komunikacije između profesora i studenta. Daljnje smjernice provedbe mentorskih sustava bile bi u:

- Poticanje i razvoj i drugih oblika mentorskih sustava;
- Izrada priručnika o mentorskom sustavu radi podrške mentorima;
- Izrada brošure o akademskom bontonu i procesu studiranja;
- Provedba anketa o zadovoljstvu i analiza mentorskih sustava;
- Digitalizacija kroz mentorski sustav.

Dvosmjerna komunikacija (usmena, pisana, digitalna) izuzetno je važan element u odnosu prema studentima koji može djelovati stimulatивно u njihovom internom okruženju utječući na samopouzdanje, motiviranost, ali i osviještenost prema radu i djelovanju kako individualnom tako i kao dijelu zajednice. Mentorski sustavi kroz različite teme, pristupe i procedure indirektno utječu i na nastavni proces te formiraju visokokvalificiranu radnu snagu koja se može prilagoditi novim i promjenjivim uvjetima na tržištu rada.

Abstract:

MENTORING SYSTEMS AS SUPPORT TO THE QUALITY OF EDUCATION

At the Faculty of Agrobiotechnical Sciences in Osijek, a quality assurance system has been recognized as a basic condition for the creation of an integrated European higher education area. Accordingly, the Faculty monitors the quality of teaching, conducts research and surveys of students and teachers on teaching, teaching content, introduction of new approaches and forms of teaching, competencies, communication with teachers, students' information about the study program, teaching and workload. The role of young and educated participants in the agricultural sector is

great, and due to the poor demographic structure in rural areas, it is necessary to invest in human resources. In order to increase the employability of graduates but also to notice the importance of the agricultural sector in the national economy, it is necessary to implement mentoring systems that could strengthen and enhance the knowledge and skills of students in the labour market. The paper presents three mentoring systems (mentor-teacher; mentor-student; mentor-employer) in different phases of operation and implementation at the Faculty. The aim of the paper is to analyse and argue the student's educational experience based on scientific and professional achievements through an individual approach of mentoring and to propose further development guidelines.

Key words: quality of education, mentoring systems, Faculty of Agrobiotechnical Sciences Osijek, employability.

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**AN APPLICATION OF INTERPRETATION
DEPLOYMENT
OF QFD: WHAT SHOPPING VISITOR PASSENGERS
NEED WHEN SITUATE IN TRAIN CABINS
OF RAPID TRANSIT LINES IN HONG KONG**

PRIMJENA INTERPRETACIJE QFD-a: ŠTO PUTNICI KOJI
PUTUJU RADI KUPNJE TREBAJU KADA SE NALAZE
U VAGONIMA BRZIH TRANZITNIH VLAKOVA U HONG KONGU

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ABSTRACT

Before the outbreak of Covid-19 pandemic, the rapid transit lines in Hong Kong were crowded with hundreds of thousands of visitors coming from the Mainland of China for buying commodities and shopping, with many of them returned on the same day or only stayed overnight. To facilitate visitor passengers on using the rapid transit lines, the rail company has focused on enhancing information services, such as providing timely travel and sightseeing news, and, improving the user-friendliness of facilities, such as designing new direction signs and ticketing machines. However, the needs related to the luggage carried by the visitor passengers, such as suitcases, travel bags and large shopping bags, have not yet been fully addressed. With the entry restriction of Covid-19 to be released in the very near future, the rail company has to get prepared for the massive influx of visitors again. Appropriate infrastructures and arrangements as well as a safe, good-order inside environment

of the train cabins not only facilitate the shopping visitors but all passengers of the rail lines. In view of this, the aim of the paper is to share a case study on using interpretation deployment of quality function deployment (QFD) to understand the needs of the shopping visitor passengers when they situate in the train cabins of the rapid transit lines in Hong Kong. The needs the case study found would provide the rail company with a useful piece of reference to make plans for improving the chaotic situations inside the train cabins as well as raising the overall train ride quality.

Key words: Quality function deployment (QFD), voice of the customer (VOC), passengers' needs, train cabin, rail line, ride quality.

1. INTRODUCTION

From the early 2000s to the late 2010s, Hong Kong had enjoyed a spectacular growth with visitors. Before the outbreak of Covid-19 pandemic, the total number of arrivals raised to 55.91 million in 2019. Compared to 29.59 million in 2009, the growth almost doubled in just a decade's time. In last twenty years, the inbound tourism of Hong Kong had experienced a structural change in terms of composition of visitors and visit purposes. First, the Mainland China had replaced the West as the main source of visitors. Second, the visitors came primarily for buying commodities and shopping instead of sightseeing. Many of them only stayed overnight, or even returned on same day. To carry the things they bought, they usually brought suitcases and travel bags with them. Rail was the most common kind of transportation they used to cross the border and to travel in the city. To accommodate such a huge increase of passengers as well as so many pieces of hand-carry luggage, not to say the sufficiency of facilities and services, just the "densely packed" train cabins had already created a whole set of problems for the rail company.

The Mass Transit Railway (MTR) is a very major public transportation network in Hong Kong, consisting of heavy rail, light rail and feeder bus service centred on a 10-line rapid transit serving the urbanized areas of Hong Kong, Kowloon and the New Territories. In only ten years' time before the outbreak of Covid-19 pandemic, the total number of passengers using the domestic service of the MTR had increased almost 20%, from 1,298 million in 2010 to 1,568 million in 2019 and reached the peak of 1,670 million in 2018. Since the start of servicing some 40 years ago, the MTR has been playing a key role in supporting Hong Kong as an international tourist city. Before the 2000s, visitors were primarily tourists from countries and areas all over the world. Over the years, the rail company has done an excellent

job on enhancing information services, such as providing timely travel and sightseeing news, and, improving the user-friendliness of facilities, such as designing new direction signs and ticketing machines, for meeting the tourist visitors' needs. However, with the residents of more and more cities in China will be allowed to visit Hong Kong as independent travellers, the rail company is required to make new efforts on supporting Hong Kong as an important shopping centre for the Mainland as well.

With the entry restriction of Covid-19 to be released in the very near future, the rail company has to get prepared for the massive influx of visitors again. Appropriate infrastructures and arrangements as well as a safe, good-order inside environment of the train cabins not only facilitate the shopping visitors but all passengers of the rail lines. In view of this, the aim of the paper is to share a case study on using interpretation deployment of quality function deployment (QFD) to understand the needs of the shopping visitor passengers when they situate in the train cabins of the rapid transit lines in Hong Kong. The needs the case study found would provide the rail company with a useful piece of reference to make plans for improving the chaotic situations inside the train cabins as well as raising the overall train ride quality.

2. INTERPRETATION DEPLOYMENT OF QFD

Interpretation deployment and conversion deployment are the two kinds of deployment in QFD. Conversion deployment had already been made use of by the Japanese manufacturers for assuring quality as early as in the early to mid-1960s. Quality charts, first used in Kobe Shipyard, were exercised in helping to convert the qualities demanded by buyers into the corresponding parameters to assure the make and the production quality of their products.¹ Conversion deployment greatly helps translate items of one aspect, for instance, the given requirements, into items of another aspect, such as the features, the parts and the processes, which would collectively contribute to meeting the given requirements. However, it does not help find out the items at the origin, that is, the needs of the customers with the product. The formulation of interpretation deployment had overcome this limitation. This added deployment is a process starting from collecting the voice of the customer (VOC), extracting need items from the collected VOC, organizing the

¹ Atsushi Takayanagi, "The concept of the quality chart and its beginning", In: Mizuno, S., Akao, Y. (eds.), *QFD: The Customer-driven Approach to Quality Planning and Deployment*, Asian Productivity Organization, 1994.

need items into needs to, finally, identifying the important needs – the control points for assuring the design quality. Upon completed doing interpretation deployment for assuring the design quality, the team could continue with doing conversion deployment for assuring the make and the production quality. First interpretation deployment and then conversion deployment of QFD enable manufacturers identify control points at every stage of manufacture to implement total quality assurance.²

The operation of interpretation deployment starts with VOC – a raw form of data that would inform the supplier about the needs of the customers. VOC is elusive in nature and seldom explicit. In order to collect VOC as complete as possible, multiple collection methods are often required.³ Gemba visiting is a method commonly used to collect VOC in QFD. “Gemba” is a Japanese word meaning “real place”, the place where real actions to be taken. Since many customers’ needs are often unvoiced, “going to the gemba” therefore could help a supplier understand how and under what circumstances its product or service was being used.⁴ In general, gemba visits provide two major kinds of information for improving product and service design. First, gemba analysis could help identify the potential failure modes and root causes in designing products and services, which often missed in conventional problem analysis.⁵ Second, gemba visits could assist suppliers on discovering customers’ latent and unspoken demands so that the product or service to be developed could surpass their basic requirements.^{6,7}

The processing of the collected VOC begins with extraction, that is, to bring out the embedded meanings from the voice and to turn the embedded meanings into items informing the needs. Interpretation usually operates with a two-time extraction. Besides it is easier to decompose a statement and reword a phrase, the in-between pause helps enrich the contents of the deployment. Interpretation not only applied to verbal expressions, but images, such

² Catherine Y. P. Chan, Glenn H. Mazur, “The two kinds of deployment in quality function deployment (QFD) for implementing quality assurance”, *The 18th ANQ Congress*, Seoul, Korea (online), 2020.

³ Glenn H. Mazur, “Getting the voice of the customer”, *The Third Symposium on Quality Function Deployment*, Novi, Michigan, 1991.

⁴ Glenn H. Mazur, “Close encounters of the QFD kind”, *The Sixth Annual Service Quality Conference*, 1997.

⁵ John Terninko, “Using the gemba to improve FMEA”, *The 12th Symposium on Quality Function Deployment / The International Symposium on QFD 2000-Nov*, Michigan, 2000.

⁶ Dale Nelson, “The customer process table: hearing customers’ voices even if they’re not talking”, *The Fourth Symposium on Quality Function Deployment*, Novi, Michigan, 1992.

⁷ D. MacDonald, “When is a cappuccino not a cappuccino? Address unspoken needs to achieve ultimate customer satisfaction”, *Quality Progress*, Vol. 45, No. 10, pp. 53, 2012.

as photos and videos, as well. For example, in the project on finding out the passengers' needs of the seat of high-speed rail in China, the team members extracted need items from the photos they took on the train.⁸ The next step is to group the need items into needs. Affinity diagramming, a bottom-up clustering technique, is often used for this process. The technique provides an approach for grouping items that are naturally related and helps identify one concept generic enough to tie the group.⁹ It is highly effective for bringing the picture of a matter clearly into view and is a creative process that could break through preconceived notions about the situation.

Identification of important needs is the final step of interpretation deployment. The needs are usually put into a survey for customers to indicate how important the needs to them. Traditionally, the indication is by rating or ranking. However, the ordinal numbers collected in such ways could hardly produce valid mathematical meanings. Among the methods suggested for solving this problem, analytic hierarchy process (AHP), a decision making model formulated by Saaty^{10,11}, is one that has been widely used in QFD. There are two reasons. First, AHP asks respondents to give judgement by making pairwise comparison so that the received responses on the importance of the given needs would be actual and more exact. Second, AHP uses ratio numbers to present priorities. As ratio numbers are mathematically operative, subsequent deployment of the priorities therefore is feasible as the priorities could be transferred from one matrix to another matrix with high accuracy.^{12,13,14}

⁸ Q. Yang, "An application of QFD: listen to the VOC for understanding the passengers' needs with the seat of high-speed rail in China", *The 24th International Symposium on Quality Function Deployment*, Hong Kong, 2018.

⁹ Jack B. ReVelle, "Quality essentials: a reference from A to Z", *ASQ Quality Press*, Wisconsin, 2004.

¹⁰ Thomas L. Saaty, *Fundamentals of decision making and priority theory with the analytic hierarchy process*, RWS Publications, Pittsburgh, 1994.

¹¹ Thomas L. Saaty, "The analytic hierarchy process: how to measure intangibles in a meaningful way side by side with tangibles", *The 19th Symposium on Quality Function Deployment / The International Symposium on QFD 2007-Williamsburg*, Virginia, 2007.

¹² Mazur, G., "ISO 16355 – the international standard for QFD", *The 21st International Symposium on Quality Function Deployment*, Hangzhou, China, 2015.

¹³ Catherine Y. P. Chan, Glenn H. Mazur, Kim E. Stansfield, "AHP for comprehensive approach of modern QFD", *The International Symposium on Analytic Hierarchy Process*, Hong Kong, 2018.

¹⁴ Catherine Y. P. Chan, Glenn H. Mazur, "ISO 16355: Modern QFD generated from 50 years of practice", *The 21st International Conference on ISO 9000 & TQM*, Zhuhai, China, 2017.

3. THE CASE STUDY

The aim of the study is to understand the needs of the shopping visitor passengers when they situate in the train cabins of the rapid transit lines in Hong Kong, using interpretation deployment of QFD as the methodology and the East Rail Line (ERL) as the ground of study.

The ERL is one of the 10 rapid transit lines of the MTR system. It is the second longest rail line in Hong Kong as well as the only rail line in Hong Kong connecting two border-crossing points, Lo Wu and Lok Ma Chau, with the Mainland of China. The rail line passes through a greater part of New Territories and terminates at Tsim Sha Tsui East, a major hotel area in the city of Kowloon. Figure 1 displayed the route map of the ERL. In the last decade, the cross-boundary service of the MTR, with a very great portion provided by the ERL, had increased almost 25%, from 9.4 million in 2009 to 11.7 million in 2018. In addition to the huge increase of cross-boundary demand, the local demand arisen from the rapid development of residential estates in the New Territories as well as that of large commercial complexes and major shopping malls along the rail line have made the ERL extraordinary crowded and extremely busy.

Figure 1. Route map of the East Rail Line in Hong Kong



Source: Downloaded from the web.

A study with the ERL conducted by the author's team before the outbreak of the Covid-19 pandemic shows that "safe stand" and "behaved environment" are the two most important needs demanded by the everyday ordinary passengers when they situate in the train cabins of the rail line.¹⁵ For the "safe stand" need, the everyday ordinary passengers not only talk about the handrails, they care their standing environment – "no kid playing nearby", "not be hit" and "no item around my feet" as well. For the concerns with be-

¹⁵ Catherine Y. P. Chan, Kwai Sang-Chin, Candace Chan, Kwok L. Tsui, "An analysis of passengers' ride needs of urban rail transit services: application of quality function deployment", *International Journal of Quality Innovation*, Vol. 5, No. 8, 2019.

haved acts, the rail company has done much work on organizing campaigns to actively promote social disciplines and pleasant manners on the train. For the concerns with the objects placed on the ground, it is necessary to investigate the needs of the shopping visitor passengers when they situate in the train cabins before able to come up with effective solutions.

Figure 2. Key characteristics of the shopping visitor passenger group

- Visitors coming to Hong Kong primarily for buying commodities & shopping
- Mainly taking rapid transit lines for crossing the border & travelling in the city
- Not familiar with the interchanges & stations of the rapid transit lines in Hong Kong
- Carrying luggage, such as suitcases, backpacks, travelling bags and/or shopping bags



Source: Made by author.

The target customers of this study are shopping visitors. Figure 2 outlined the key characteristics of this passenger group.

3.1. Collect VOC and Analyse the Collected VOC to Identify Need Items

Before the outbreak of the Covid-19 pandemic, the train cabins of the ERL were full of shopping visitors – the situation the team conducted the study about the needs demanded by the everyday ordinary passengers. However, the entry restrictions of the Covid-19 have drastically reduced the number of visitors coming to Hong Kong. Figure 3 exhibits the situations of the train cabins of the ERL before and after the outbreak of Covid-19 pandemic. Without able to observe and to talk to the shopping visitor passengers on the train, gemba visiting and dialoguing at site could hardly be used as the methods to collect VOC. In regard to this limitation, the team switched to use “distance” methods to collect the required voice.

Figure 3. Train cabin situations of ERL before and after outbreak of Covid-19 pandemic



Source: Made by author.

To start the study, the team members sat down together to recall what they had noticed on the train during their gemba visits to collect VOC about the needs of the everyday ordinary passengers. A common phenomenon that they found is the shopping visitor passengers tend to stay in the doorway area. The backpacks, the suitcases, the big shopping bags they carried therefore often caused serious blockages for other passengers to get on and off the train. Upon discussion, the team decided to use exploring the reasons why the shopping visitor passengers do not move into the train cabins as well as investigating how they manage their suitcases as the starting point to understand the needs of the shopping visitor passengers when they travel on the ERL trains.

The team members reviewed the photos they had taken during the gemba visits in the study about the needs of the everyday ordinary passengers to identify those that had captured the scenes that would inspire them and/or inform them something about the needs. They employed the question-and-answer technique to do scene interpretation and used a VOC table to guide the process and to note down the extracted items.

Figure 4. Example of question-and-answer technique for doing scene interpretation

- Q: Why you not place your bag (carrying) beneath the bench?
A: It is difficult to put it into the space underneath the bench.
Q: How difficult it is?
A: I can only be able to put it in or take it out when nobody stands in front of me.
Q: Why need to be nobody standing in front of you?
A: I have to first horizontally place my bag/suitcase on the floor before able to push it in or pull it out.



Extracted Item: **No need to ask other passengers to give the way before able to put in and take out my suitcase**

Need Item: **I do not need to ask other passengers to give way when I put in/pick up my suitcase**

Source: Made by author.

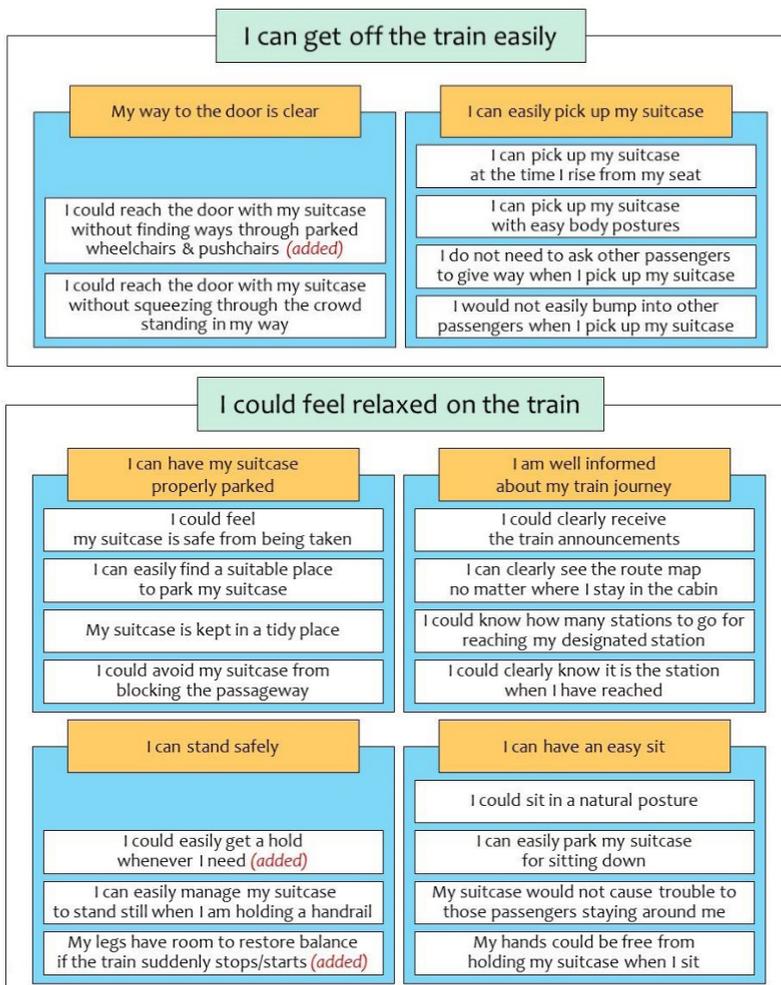
Figure 4 is an example illustrating how to use the question-and-answer technique to do scene interpretation. In the example, the team started with a question, asking the passenger in the photo why not placing his bag beneath the bench. The team then, noted from the perspective of the passenger, answered that it is because difficult to put the bag into the space underneath the bench. Based on the given answer, a follow-on question was asked and an answer was given to the question. The process of alternate questions and answers stopped when the team members found they had determined what the passenger needed. In the process, the team members from time to time reviewed what they had done, rephrased the items to better reflect what the passengers were describing and added in missing items whenever they identified them. By the end of the interpretation process, 18 need items were identified.

3.2 Grouping and Organizing Needs

The team invited two target customers, with both of them had visited Hong Kong a few years ago, to participate in an online activity for putting the need items into natural groups, using the affinity diagramming method. On the computer screen, each need item was put into an electronic post-it. Before moving the post-its, the two customers were asked to go through the need items one

by one to make sure they understand the respective meaning. After reviewing the need items, they started grouping the post-its into clusters from their perspectives. They first put the need items having an affinity into a cluster or sub-group, at the same time removing needs that overlapped others significantly or were a rephrasing of other needs. They were also asked to add in items they thought were missing. For each cluster or sub-group, they reviewed and wrote down a precise and concise representation statement. After that, the two customers were asked to group the clusters or sub-groups further and gave a “label” for this bigger group. During the process, adjustments were made whenever necessary.

Figure 5. Resultant affinity diagram of shopping visitor passengers’ needs



Source: Made by author.

The resultant affinity diagram, exhibited in Figure 5, gave a fuller picture about the needs of the shopping visitor passengers when they situate in the train cabins of the ERL.

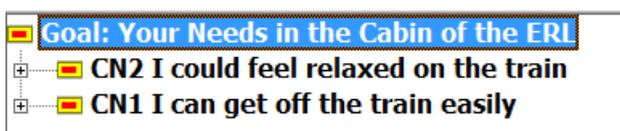
3.3. Prioritize the Needs

The final step of interpretation deployment is to identify the important needs. To produce mathematically valid results, analytic hierarchy process (AHP) was used to do the involved prioritization and the software of ExpertChoice® was used to process the collected responses and perform the involved calculation.

The team invited 30 target customers to participate in the AHP pairwise comparison survey to find out the important needs. For the 30 target customers participated in the survey, 2 of them were the ones who did the affinity diagramming for the need items. The other 28 target customers, 23 from Southern China, 2 from Northern China and 3 from South-East Asia, were invited by the team through personal connections. The survey was conducted online. Each target customer was individually met online for completing the survey.

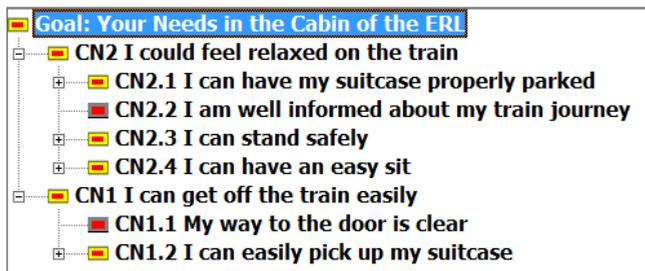
In each online meeting, the team member first explained to the interviewee the purpose of the survey and how to do pairwise comparison. After going through the needs one by one and confirmed that the meaning of each item included in the six affinity diagrams was well understood, the interviewee was presented with a questionnaire displaying the needs in pairs. Figure 6 and Figure 7 display the items of the primary level and those of the secondary level of which the importance to be evaluated by each interviewee respectively. For each pair of needs, the interviewee was asked to indicate which need of the two was more important to him/her and how much more important. To help make the pairwise comparison easier, the interviewee was asked to rank the needs first before filling in the questionnaire.

Figure 6. Items of the primary level of which the importance to be evaluated by each interviewee



Source: Made by author.

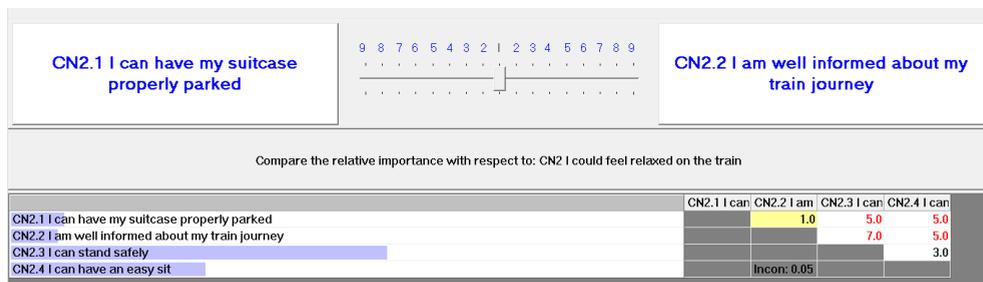
Figure 7. Items of the secondary level of which the importance to be evaluated by each interviewee



Source: Made by author.

As soon as the interviewee had completed the questionnaire, the team member entered his/her responses into ExpertChoice® (Figure 8). The generated consistency ratio would reflect if the interviewee was clear about his/her opinion on the relative importance of the needs. If the consistency ratio was greater than 0.1, the team member would ask the interviewee to recheck his/her responses. The meeting was ended when the consistency ratio was less than or equal to 0.1.

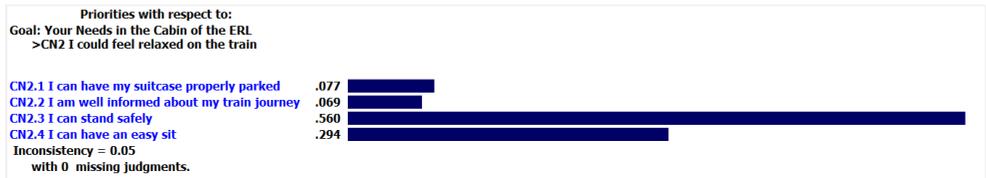
Figure 8. Data entry into ExpertChoice® of one set of responses of the secondary-level items



Source: Made by author.

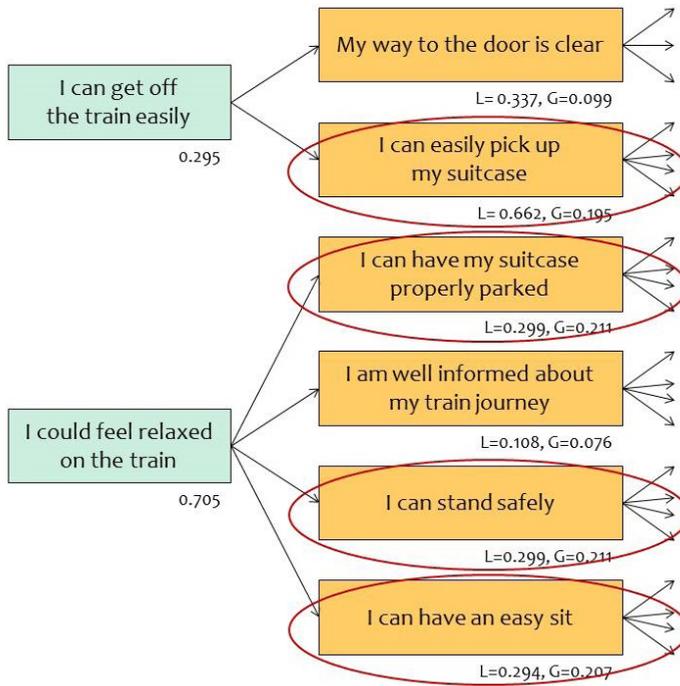
The team first found out the importance of the two items of the primary level and then the importance of the four items of the secondary level. The responses of each customer were first processed. Figure 9 is an example showing the result of one set of individual responses. Subsequently, the individual results were synthesized into an aggregate result.

Figure 9. Importance of the secondary-level items of one set of responses



Source: Made by author.

Figure 10. Overall importance of the first-level and secondary-level items



Source: Made by author.

Figure 10 displays the overall importance of the items of the primary and the secondary levels. The four circled ones are the important needs that identified.

4. DISCUSSION

Safe stand to shopping visitor passengers is also of paramount importance, same as that of everyday ordinary passengers. The need “I can stand safely”, scoring 0.211, is one of the highest two among the four important needs. To everyday ordinary passengers, as mentioned above, safe stand is talking about “no kid playing nearby”, “not be hit” and “no item around my feet”. To shopping visitor passengers, safe stand is talking about “can easily manage his/her suitcase to stand still when he/she is holding a handrail” and “their legs have room to restore balance if the train suddenly stops/starts”. Both passenger groups care about the objects that placed on the floor, such as suitcases, travel bags, shopping bags, as they would violate their safety on the moving train. Safety, at all time to all passengers, is always the ultimate fundamentality of train ride quality.

Another most important need “I can have my suitcase properly parked” also scored 0.211. Two of the four constituents of this need – “My suitcase is kept in a tidy place” and “I could feel my suitcase is safe from being taken” are easily understood. No shopping visitor passenger wants his/her suitcase parked in dirty and messy place; and, no shopping visitor passenger wants his/her to be taken by other passengers intentionally or by mistake. Maybe because of these concerns, the shopping visitor passengers would like stay aside by their luggage or place their suitcases, travel bags and shopping bags on the floor in front of them and within their reach so that they could watch them. The other two constituents of this need – “I can easily find a suitable place to park my suitcase” and “I could avoid my suitcase from blocking the passageway” carry a major implication to the rail company. The everyday ordinary passengers do not want shopping visitor passengers’ suitcases block their way; and, the shopping visitor passengers themselves do not want their suitcases block everyday ordinary passengers’ way. Both passenger groups would like to have order inside the train cabin. It is an important job of the rail company to restore the harmony and create a pleasant journey for all passengers.

The other two of the four important needs are “I can have an easy sit” (0.207), and, “I can easily pick up my suitcase” (0.195). These two needs have similar nature as that of the need “I can have my suitcase properly parked”. There are two aspects in regard to these two needs. The first aspect is direct interaction with their luggage. On the one hand, the shopping visitor passengers care about how they could easily park their suitcases after they have got on the train, including “I could sit in a natural posture”, “I can easily park

my suitcase for sitting down” and “my hands could be free from holding my suitcase when I sit”. On the other hand, the shopping visitor passengers care about how they could easily pick up their suitcases before they got off the train, including “I can pick up my suitcase at the time I rise from my seat” and “I can pick up my suitcase with easy body posture”. These concerns, to a significant extent, could be addressed through making appropriate design for the hardware, such as the seats and the storage set-ups. Ergonomics, technology, materials, all these are some of the essential elements that would collectively make up quality designs. The second aspect is indirect interaction with their luggage. The shopping visitor passengers care about how they could affect their neighbouring passengers to the least when handling their suitcases, including “my suitcase would not cause trouble to those passengers staying around me”, “I do not need to ask other passengers to give way when I pick up my suitcase” and “I would not easily bump into other passengers when I pick up my suitcase”. To address these concerns, actions would extend to making appropriate floor plans for the train cabins as well, such as the location, the area allocation, the layouts of the seats and the storage set-ups.

The two least important needs, “my way to the door is clear” (0.099) and “I am well informed about my train journey” (0.076) also conveyed some useful messages to the rail company. First, as station, rail line, interchange information not only has been comprehensively provided at every station and on the train and the information could also be easily accessed via mobile phones; shopping visitor passengers, to very great extent, could get hold of their train journey by themselves. Second, the low importance of “my way to the door is clear” could reflect the phenomenon that shopping visitor passengers naturally would like to stay at the door side so that they can get on and off the train easily and quickly.

5. CONCLUSION

The case study informed the rail company the important needs the shopping visitor passengers required when they situate in the train cabins of rapid transit lines in Hong Kong. However, it is necessary to collect responses from a larger number of target customers to validate the important needs that found. Thorough understanding with user needs is fundamental to achieving quality. The discussion of the results would provide the rail company some valuable references for improving the interior design, infrastructures and facilities of train cabins for meeting the passengers’ needs.

The situation inside the train cabins is a form of simultaneous form of co-use.¹⁶ Although many shopping visitor passengers tried best to avoid “crossed use” and many everyday ordinary passengers tried best to accommodate “crossed use”, both physical safety and conflicts between passengers would easily occur if the order and the arrangement inside the train cabins are not properly managed. Inserting “partition” would be an effective way to alleviate the problems, such as make reorganization within the cabin, separate the cabins for different passenger groups, or even separate the platforms. The rail company is recommended to take further study to investigate which kinds of partition and at what level the partition to be inserted would be appropriate for addressing the needs and meeting the limitations.

Last but not least, interpretation deployment of QFD could readily be extended to various dimensions and aspects for improving train ride quality when appropriate adaptations and modifications have been made, such as improving the lobby and the platform of stations. Other kinds of public mass transport systems could also make use of it for improving their ride quality. However, due to the specific types of problems, the services and different layout of the cabins, adjustments would be required.

Sažetak:

PRIMJENA INTERPRETACIJE QFD-a: ŠTO PUTNICI KOJI PUTUJU RADI KUPNJE TREBAJU KADA SE NALAZE U VAGONIMA BRZIH TRANZITNIH VLAKOVA U HONG KONGU

Prije izbijanja pandemije Covid-19, linije brzog prijevoza u Hong Kongu bile su krcate stotinama tisuća posjetitelja koji su dolazili iz kopnene Kine radi kupovine, a mnogi od njih su se vratili istog dana ili su prenoćili. Kako bi posjetiteljima olakšala korištenje brzih tranzitnih linija, željeznička tvrtka usredotočila se na poboljšanje informacijskih usluga, kao što je pružanje pravovremenih informacija o putovanjima i razgledavanju, te poboljšanju pristupačnosti objektima, kao što je dizajniranje novih znakova smjera i strojeva za prodaju karata. Međutim, potrebe za prtljagom koju nose putnici posjetitelji, kao što su koferi, putne torbe i velike torbe za kupovinu, još nisu u potpunosti riješene. Budući da će ograničenje ulaska Covid-19 smanjiti u vrlo bliskoj budućnosti, željeznička tvrtka mora se ponovno pripremiti za veliki priljev posjetitelja. Odgovarajuća infrastruktura i ustroj, kao i sigurno, uređeno unutarnje okruženje vagona vlaka ne samo da olakšavaju kupnju posjetiteljima već

¹⁶ Catherine Y. P. Chan, “Manage co-use with quality function deployment (QFD) for quality and sustainability”, The 21st International Symposium on Quality, Proceedings *Quality – yesterday, today, tomorrow*, Croatian Quality Managers Society, (online).Zagreb, Croatia, 2020

i svim putnicima na željezničkim prugama. S obzirom na to, cilj rada je prezentirati studiju slučaja o primjeni interpretacije implementacije funkcije kvalitete (QFD) za razumijevanje potreba putnika posjetitelja radi kupnje kada se nalaze u vagonima vlaka brzih tranzitnih linija u Hong- Kongu. Potrebe koje je studija slučaja pronašla pružile bi željezničkoj tvrtki korisnu referencu za izradu planova za poboljšanje kaotičnih situacija u vagonima vlaka, kao i za podizanje ukupne kvalitete vožnje vlakom.

Ključne riječi: implementacija funkcije kvalitete (QFD), glas kupca (VOC), potrebe putnika, vagoni vlaka, željeznička pruga, kvaliteta vožnje.

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THE LEVEL OF FREIGHT SERVICES PROVIDED IN TRANSPORT MARKET

RAZINA TERETNIH USLUGA PRUŽANIH NA TRŽIŠTU
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ABSTRACT

The process of the quality management can be defined as the continuous effort of employee management in an organization, which is necessary to ensure long-term customer satisfaction and fidelity. Quality management is an integral part of every organization. It is combination of interconnected tools and solutions that can be used to achieve higher level in transport services. Due to personal requirements, customers in the field of freight transport services have a choice of different types of transport offers and provided transport services. Research and the use of expert methods have shown that road and rail transport are among the most preferred modes of freight transport. As a part of the evaluation of the current offer and criteria of freight trans-

port, an analysis of the offer of services of road and rail freight carriers was realized. This article sets out qualitative criteria that customers most often prefer when choosing a carrier. Using the Delphi expert method, that expected customer satisfaction with services of the addressed carriers was evaluated. Furthermore, the actual satisfaction with services offered by road and rail freight carriers was evaluated in the form of the Saaty method with the help of customers. From the results of the surveys, the advantages and obstacles of road and rail freight transport were defined. Based on the bottlenecks that have been demonstrated and defined, a group of measures has been developed to increase the attractiveness of rail freight transport.

Key words: quality, services, freight transport, carriers, customers.

1. INTRODUCTION

Transport is currently one of the most important indicators in the development of any advanced countries. Basic goals of transport policy in the European countries are mainly focused on the sustainable development of road and railway infrastructure on both national and international level. Customer requirements in transport are increasingly demanding, especially as regards the services offered by freight carriers. Given that competitiveness in the freight transport market is currently at high level, carriers have to meet these requirements from customers reflect in the most ideal possible form. From the customer's point of view, in particular is always a matter of compliance delivery time, in the required quality and beyond adequate costs. Every mode of transport has a common goal, which is to meet the needs of customer which serves the purpose of promoting mobility. The range of services offered, which the carrier has the possibility to offer to the customer is defined by transport infrastructure, by covering the transport network and the capacity of the vehicle fleet, in terms of type of commodity and its state. Significant influences on the density and length of the road network, especially the location, are and the geographical characteristics of the particular country from which population density continues to develop areas concerned. Due to the narrow specifics and properties of some commodities, a given type of goods can be transported by only one mode of transport. It is often mainly its oversized or condition. In many countries of the European Union, the supply of road transport and carriers is significantly higher than in rail transport. This is mainly due to the higher density of the road transport network and also to the fact that every manufacturing company has obvious access to road infrastruc-

ture which also results in a high supply of road transport and high competitiveness. The emergence of this situation is also caused by the large amount of railway undertakings operating their services on main lines, whereas lower-class lines are less attractive for railway carriers. Nevertheless, road and rail freight transport are the most preferred for EU countries and alternative to freight transport in many cases regardless of the transport distance.

Within the scientific literature, competing business in transport is defined as competition about customers, which includes manufactures, carriers, customers, and final consumers who intend to satisfy their economics interest. The biggest benefit of competition is innovation and consequent increase of various qualitative variables such as technological changes in the transport process, accessibility and innovation offered services and development of technical equipment. That's why customers have the opportunity to choose from a wide range of services that are increasingly at a higher level and at attractive prices. The following points of the article will therefore compare the level of quality of individual services for road and rail carriers. This comparison will be performed by using expert methods and questionnaire survey of satisfaction, which will be carried out in collaboration with customers of individual carriers.¹

2. IDENTIFICATION QUALITY OF SERVICES USING BY EXPERT METHODS

As with all services, the major goal of transport is to satisfy the customer needs and requirements. In the process of growing demand for transport services, the number of companies offering their main and additional services is also growing freight transport activities. It has also been shown that this offer of haulers is very wide, especially in road transport, resulting in greater flexibility and competitiveness in the offered services.

As part of survey evaluating the current supply and criteria of road freight transport, offered by carriers, a prognostic and multicriteria analysis was created provided that the selected criteria are met. The monitored objectivity of the analysis was ensured in the form of the Delphi expert method, in which road haulers were involved for the objective evaluation of the criteria. In this method, haulers replaced the function of experts to carry out an assessment of the

¹ European Union law, *Transport.*, 2009. Available at: https://eurlex.europa.eu/summary/chapter/transport.html?root_default=SUM_1_CODED%3D32%2CSUM_2_CODED%3D3205&locale=en

presumption of compliance with the criteria and services provided by carriers offer. These results from research are recorded in the following table 1.

In the next part of the table, customers are evaluated in the form of Saaty method the quality of the services provided, and the reserved criteria sought by the carriers guarantee in maximum quality. The essence of this method lies in pairwise comparisons and the primacy of given qualitative indicators. Criteria of quality related to freight transport that the respondents had to choose from, were selected by the sponsor and using the descriptor scoreboard, were the significance assigned according to preference the importance of superiority over other indicators according to the number of points awarded. A description of the specific evaluation of the Saaty method and the selected criteria are given below in table 1.

Table 1. Evaluation and criteria of the Saaty method

Score	Descriptor
1	Criteria are equally important
3	The first criterion is a little more important than the second
5	The first criterion is much more important than the second
7	The first criterion is demonstrably more important than the second
9	The first criterion is absolutely more important than the second
Criteria	
K1	Delivery time and time of transport
K2	Expertise, approach and communications with employees of transport company
K3	To inform about the consignment during transport
K4	Customs proceedings and its technological course
K5	Additional services
K6	Total shipping costs

Source: Made by authors.

From a subjective point of view, the indicator was assigned the number of points in terms of greater importance of a criterion. Therefore, it is not possible among themselves compare one indicator, therefore the numbers 1 are placed on the main diagonal of the table. After assigning the points, a line geometric average was calculated for all rows, in order to create weights of the importance of the individual criteria. Subsequently, in the first part of the table, the experts created an estimate of the performance of specific qualitative indicators and have been assigned an approximate level of quality provided services. In order to verify this estimate, an analysis was made of the actual fulfillment of the guaranteed criteria, which were assessed by customers. The procedure was the same as in the first part of table, except that the current

Another part of comparing the level of services provided in rail freight transport was a comparison of expected and current satisfaction with the services offered. As in the case of road transport, Delphi method was used, which determined subjective assumption for carriers on the level of services provided. They were further independently contacted with customers of railway undertakings in order to be able to assign a weight representing the current quality of the services offered in railway transport. In order to the comparison to be objective, the same evaluation criteria were used as well as the same superiority and inferiority of selected indicators, as in the same case of road transport. Evaluation descriptors and criteria are identical to those of road transport in table 2. In the first half of the next table 3 shows the expected quality levels of services provided, evaluated by carriers, and the second half of table 3 shows the actual values of the services offered by carriers, which were rated by customers, using the Saaty method. Approach, which was used for compiling the table is also identical to when comparing services in road transport.⁴

Table 3. Use of the Delphi and Saaty methods in railway freight transport

Railway transport										
Criterion	K1	K2	K3	K4	K5	K6	Geometric diameter	The expected quality of the service provided	Maximum quality of service provided	Estimated degree of fulfillment of criteria by carriers
K1	1	3	7	3	5	3	3.13	297.6	313.26	95.00%
K2	0.33	1	3	3	0.2	0.20	0.70	65.32	70.23	93.00%
K3	0.14	3	1	0.20	0.33	0.14	0.40	37.52	39.98	94.00%
K4	0.33	0.33	5	1	0.20	3	0.83	74.94	83.27	90.00%
K5	0.20	5	3	3	1	3	1.73	159.35	173.21	92.00%
K6	0.33	5	7	0.33	0.33	1	1.04	95.02	104.42	91.00%
Summary							7.83	729.8	784.36	93.04%
Criterion	K1	K2	K3	K4	K5	K6	Geometric diameter	Real quality of the service provided	Maximum quality of service provided	Real degree of fulfillment of criteria by carriers
K1	1	3	7	3	5	3	3.13	291.33	313.26	93.00%
K2	0.33	1	3	3	0.20	0.20	0.70	65.32	70.23	93.00%
K3	0.14	3	1	0.20	0.33	0.14	0.40	37.58	39.98	94.00%
K4	0.33	0.33	5	1	0.2	3	0.83	74.94	83.27	90.00%
K5	0.20	5	3	3	1	3	1.73	159.35	173.21	92.00%
K6	0.33	5	7	0.33	0.33	1	1.04	95.02	104.42	91.00%
Summary							7.84	728.54	784.36	92.25%

Source: Made by authors, addressed carriers and customers.

From the previous table it can be clearly determined that the actual customer satisfaction with the given services in railway transport is lower than

⁴ STN EN ISO 9000:2001 *Systémy manažérstva kvality. Základy a slovník* (Quality management systems – Fundamentals and vocabulary), 2005.

expected by carriers. In this case, there may be a risk that several customers may switch from rail transport to road transport. Ideal case would be not to consider road and rail transport as competing modes of transport, but to point out the potential for synergies between road and rail carriers and increase competitiveness of the services offered. The synergistic consequence is the interaction of certain factors, which can lead to achieve greater overall effect of the monitored process.⁵

3. QUESTIONNAIRE SURVEY OF THE QUALITY OF SERVICES PROVIDED

Customers have usually a choice of different modes of freight transport. There are many forms of procedures to find out from a customer satisfaction or possible shortcomings of the services offered. One of the most challenging and important partial goals was the creation of a questionnaire survey, which the intention was to find out from the customer what input criteria and factors influence the choice of transport mode. This survey was created for companies focused on production, storage and the distribution of products, semi-finished products, various materials and commodities, that are needed at the end of the production chain to transport to the final customer. From the customers' point of view, the survey needed to find out the most common preferences for choice of transport mode and carrier, using qualitative indicators and find out the most important criteria in choosing the mode of transport that are mostly for customers essential. From the results of the survey it can be shown that among of these the most important criteria includes except for costs of carrying out the transport belongs also the total transport time, where the customer is willing to shorten this time and increase a certain percentage of the original total transport costs. Since the survey has been designed to support the rail freight transport, questions were selected to identify the main shortcomings and common causes preference for road freight transport over rail transport. The first survey in the slovak language was intended for companies based in the Slovak Republic in order to determine the most common modes for transporting goods on the territory of Slovakia.⁶ The second survey

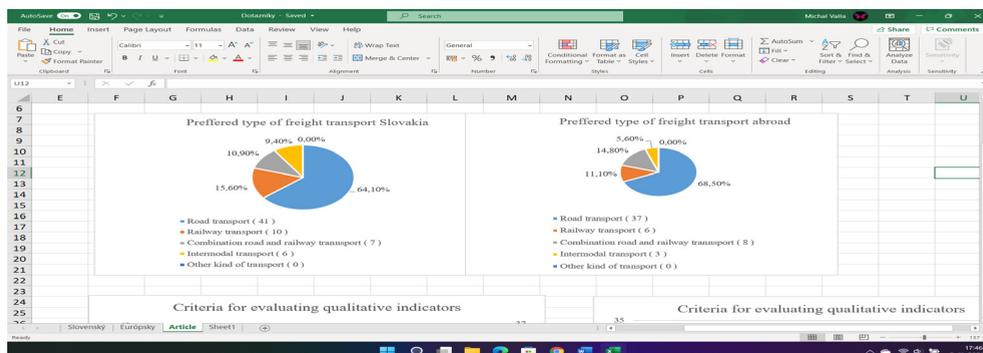
⁵ Eva Nedeliaková, Anna Dolinayová, Ivan Nedeliak, *Transport service quality assessment methods*, Bratislava, 2015.

⁶ Ibid.

in English⁷ with the same intenton, was aimed for companies located abroad within the EU. Within the time duration of survey implementation, a total of 64 companies based in Slovakia and 54 foreign companies or customers were contacted, which may be considered sufficient for closing in view of the demanding data collection survey.

The following figure 1 shows the total number of responses and the proportion of preferences on the most frequent choice of mode of the transport, when transporting goods to a specific company. From the figure it can be found, that road transport is expected to have the largest share of transports in the addressed companies. In view of this situation, further questions will be asked in the survey to determine the reason of the absence of non-use rail transport for the transport of the required goods in companies.

Figure 1. Preferred mode of freight transport



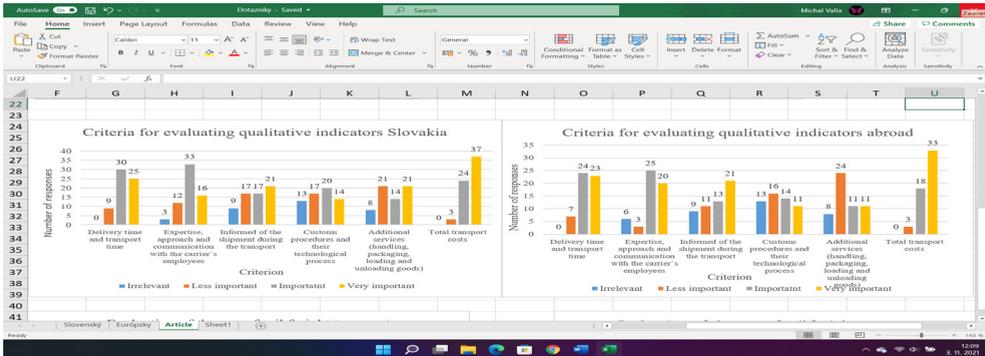
Source: Made by authors and addressed customers

Another part of the survey was focused on evaluating the level of qualitative indicators within the transport chain. It was in order to find out which offered services are the most important and which are less important for customers throughout the transport chain. For this reason, respondents had the same choice of assessment, as in the previous survey, so to evaluate the given indicators from a very important degree to insignificant factors. The results of the evaluation of the given qualitative indicators, as well as indicators them-

⁷ Borna Abramovic. Et al., *Synergy in Logistics Processes for Railway Transport*, In: 17th International Scientific Conference on Business Logistics in Modern Management, Osijek, Croatia, 2017.

selves are shown in the following figure. It should be noted, however, that the most important criteria offered included the delivery time of the consignment, communication with the carrier or railway undertaking and, of course, the total cost of carrying out the transport of the goods.

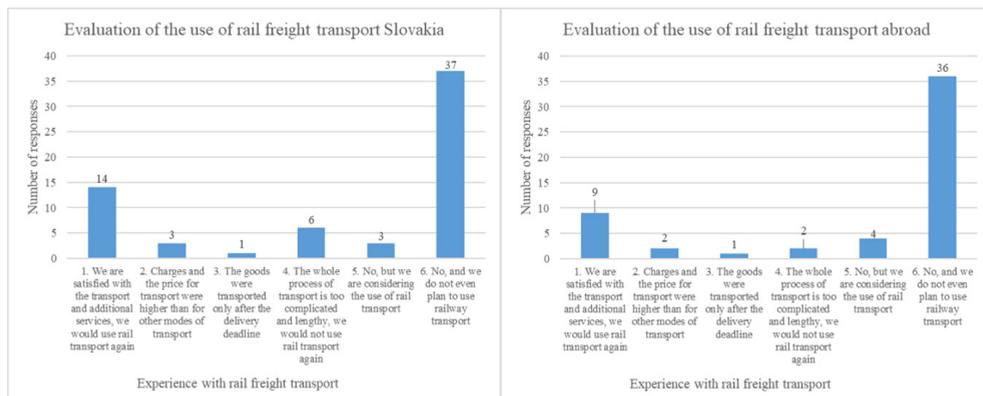
Figure 2. Criteria for evaluating qualitative indicators



Source: Made by authors and addressed customers

Given that in the first question, several respondents answered that they use rail transport for transporting goods, or a combination of rail transport with another mode of transport. It was in our interest to find out the satisfaction and experience of the rail transport, or with a rail carrier. Other valid reasons why the customer can refuse the rail transport and thus give priority to road transport, may be higher price and the lengthy process of carrying out administrative formalities before the current process at the beginning of the transport operation.

Figure 3. Evaluation of the use of rail freight transport



Source: Made by authors and addressed customers.

Customers had the option to choose except positive evaluation of rail transport and additional services, including experience with a negative consequence related to the transport of goods by rail. In case if the customer has not yet used rail transport, it would be interesting to find out if will consider this alternative mode of transport in the future. In the following figure 3, between options 1 to 4, proven experience and quality evaluations within the use are shown rail transport and options 5 and 6 commented on customers who have no experience with the transport of goods by rail.

4. CONCLUSION

Due to the large absence of railway infrastructure in companies, it is impossible in some cases, operate door-to-door rail transport, in which road transport is making significant progress. All the above indicators can be considered as key in the process decision-making and planning in transport, which can also be understood as the quality of transport services. An effective strategy in transportation does not only result in a reduction of traffic costs for carriers and shippers, but thanks to optimization methods and processes helps increase the efficiency of the company and competitiveness. In the previous steps, a clear dominance of road transport was demonstrated above railway, both from the point of view of clients and from the point of view of carriers. From the survey, the Saaty's method also found that customers satisfaction

with services is on high level in both cases, but for a more specific analysis of service levels, in the next chapter of article created a questionnaire survey, which includes a detailed determination of customer preferences in the services offered and the most common choice of the mode of transport they use in carrying out their shipments.

Sažetak:

RAZINA TERETNIH USLUGA PRUŽANIH NA TRŽIŠTU TRANSPORTA

Proces upravljanja kvalitetom može se definirati kao kontinuirani napor menadžmenta i zaposlenika u organizaciji, koji je nužan kako bi se osiguralo dugoročno zadovoljstvo i vjernost kupaca. Upravljanje kvalitetom sastavni je dio svake organizacije. To je kombinacija međusobno povezanih alata i rješenja koja se mogu koristiti za postizanje više razine u transportnim uslugama. Zbog osobnih zahtjeva, kupci na području usluga prijevoza tereta imaju izbor različitih vrsta prijevoznih ponuda i pruženih transportnih usluga. Istraživanja su pokazala da su cestovni i željeznički promet među najpoželjnijim vidovima prijevoza tereta. U sklopu ocjene trenutne ponude i kriterija prijevoza tereta, izvršena je analiza ponude usluga cestovnih i željezničkih teretnih prijevoznika. Ovaj članak postavlja kvalitativne kriterije koje kupci najčešće preferiraju pri odabiru prijevoznika. Koristeći Delphi ekspertsku metodu, procijenjeno je očekivano zadovoljstvo korisnika uslugama adresiranih prijevoznika. Nadalje, stvarno zadovoljstvo uslugama koje nude cestovni i željeznički teretni prijevoznici procijenjeno je u obliku Saaty metode uz pomoć kupaca. Iz rezultata istraživanja dodatno su definirane prednosti i prepreke cestovnog i željezničkog teretnog transporta. Na temelju dokazanih i definiranih uskih grla, razvijena je skupina mjera za povećanje atraktivnosti željezničkog teretnog transporta.

Ključne riječi: kvaliteta, usluge, transport tereta, prevoznici, korisnici.

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QUALITY COSTS IN LOGISTICS AND TRANSPORT PROCESSES

TROŠKOVI KVALITETE
U LOGISTIČKIM I PROMETNIM PROCESIMA

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ABSTRACT

Quality costs are included in all costs faced by the organization. They may indicate insufficient quality of management, i.e. management competence. As such, quality costs can be divided into internal and external, i.e. costs that can be identified in the short term and costs that can only be identified in the long term. Since logistics and transport processes are responsible for providing all the necessary resources for the normal functioning of society, the occurrence of costs due to poor quality, which are determined by poor mitigation plans can result in an increase in the total price of the service or the total cost of the product or service. This paper presents the basis for cost analysis due to poor quality as well as the proposed systematic way of observing costs. The professional contribution of the paper refers to the definition of indicators that management can use in the analysis of management performance, while the

scientific contribution refers to the creation of a basis for a different view of quality costs through the prism of all dependent costs that may arise. The paper is based on a conducted secondary research.

Key words: Costs of poor quality, risks, logistics processes.

1. INTRODUCTION

Transport and logistics are part of the supply chain and have an irreplaceable role in the functioning of the supply chain and society. Logistics can be defined as an activity or set of activities that deal with space and time using different modes of transport, to deliver the required amount of resources in a precisely defined time to a precisely defined location.¹ When transporting products from one place to another, or when providing all the necessary resources for the smooth operation of the system, some risks can result in different kinds of costs. The costs that may arise can be divided into two basic groups, quality costs and non-quality costs.² No matter what the costs are, they result in an increase in total transport costs, which increases the cost of logistics services. However, in addition to increasing costs, and insufficient logistics process can result in consequences that are not visible in the short term but in the long run, and which relate to the unavailability of products in an area or inability to provide services.³ Furthermore, the unavailability of products or the inability to provide services can result in a decline in the quality of life of the population and society as a whole, which can also be seen as a cost due to poor quality or poor quality of management. Given the importance that quality costs can have, and due to the role that transport and logistics have in the normal functioning of society, quality management of all transport and logistics processes can be a prerequisite for ensuring efficiency.⁴ On the other hand, quality costs can be used to analyze the quality of management of logistics and transport processes, since their amount may indicate a lack

¹ Darja Topolšek, Kristina Čiziūnienė, Tina Cvahte Ojsteršek, „Defining transport logistics: a literature review and practitioner opinion based approach“, *Transport*, 2018, pp. 1196-1203.

² Alexandros Antonaras, Chrysi Memtsa, Melpo Iacovidou, „The challenge of measuring the cost of quality,“ Proceedings of 4th Annual Quality Congress Middle East, 2010.

³ Fausta Ari Barata, „High Cost of Logistics and Solutions“, Proceedings 17th International Symposium on Management, 2020, pp 407-410.

⁴ Shams U. Rahman, „Quality management in logistics services: A comparison of practices between manufacturing companies and logistics firms in Australia,“ *Total Quality Management and Business Excellence*, Vol. 19, No. 5, 2008, pp 535-550.

of competence of management or the organization as a whole. Since quality costs are often hidden costs and often do not always have to be measurable, this paper aims to show the complexity of quality costs in transport and logistics processes as well as to provide a basis for their systematic observation. Also, the paper aims to propose a basis for creating indicators that can be used to identify quality costs by looking at all direct or indirect costs that may occur in the transport or logistics process.

The professional contribution of the paper refers to the definition of indicators that can be used when analyzing the success of management or considering the costs that could have implications for the management of the organization. The scientific contribution of this paper is to create a basis for a different view of quality costs through the prism of all dependent costs that may arise, which can be the basis for further research related to quality costs.

2. QUALITY COSTS

Quality costs are defined as all expenditures incurred if activities are performed incorrectly, i.e. if non-compliances occur due to which the organization or individual must have additional expenditures to correct the problem or damage.⁵ If viewed in more detail by type, quality costs can be divided into quality costs and non-quality costs where quality costs represent all the costs that an organization or individual have to prevent non-compliance. On the other hand, the cost due to poor quality represents all benefits that the organization or individual has, and which occur due to insufficient level of quality, or omission.⁶ Therefore, if the costs of quality are considered in the context of traffic, the cost of quality is all the costs that the organization or system has, which are aimed at preventing accidents or externalities in traffic, while on the other hand, the costs of poor quality are all costs incurred due to the need to repair the consequences of a traffic accident, or externalities in traffic. The costs of prevention can often be significantly lower than the costs incurred due to insufficient quality. In other words, if measures are taken in the system to reduce the risk of an anomaly or to eliminate its possibility, the costs of poor quality can also be reduced.

⁵ Tonći Lazibat, Božo Matić, „Troškovi kvalitete kao čimbenik povećanja konkurentnosti na domaćem i svjetskom tržištu“, *Ekonomski pregled*, Ekonomski institut, Zagreb, 2000, Vol. 51, No. 11-12, str. 1334-1351.

⁶ Miroslav Drljača, „Pojam i podjela troškova kvalitete, *Kvaliteta*, broj 3-4, Infomart, Zagreb, 2003, str. 5-8.

Quality costs can be expressed through financial indicators and not financial indicators i.e. quantitative and qualitative approaches. Financial indicators represent all costs expressed in money while non-financial indicators show costs that are often long-term and can be reflected in the declining reputation of the organization, loss of time, decreasing of life quality, litigation costs, etc. Non-financial costs of quality are much more difficult to identify and they are usually hidden and can be identified only as a consequence while the financial cost of quality can be calculated as the amount of cost in the cumulative of all costs related to the observed area.

The cost of quality can be determined by the quality of construction or the conformity quality. The quality of construction is created during the design, ie the creation of the product, and it means defining the functionality that the product will have as well as defining the materials that will be used during production. On the other hand, conformity quality refers to compliance with the requirements of stakeholders.⁷ In the context of transport and logistics, the quality of construction refers to technical solutions used in infrastructure, ie all vehicles and systems used in the process, while the quality of conformity refers to customer satisfaction with logistics and transport services.

2.1. Quality costs as an indicator of quality management

Quality costs, ie costs due to poor quality can also be used as a basis for the analysis of quality of management, as high costs due to poor quality may indicate a lack of management focus on prevention and risk. Prevention and risks, ie a risk-based approach, is the basis of quality management of the organization, which is also defined by the quality management system standard ISO 9001:2015.⁸ In addition, high levels of cost due to poor quality may indicate a lack of management competence, ie a focus on defining plans that would address the risks of non-compliance or variability that may result in additional costs to the organization. In addition, the costs due to poor quality can be outlined through the decline in productivity or efficiency of the system.⁹ Through the calculation of quality costs, the organization's focus on improvements can be identified, since the increase in costs due to

⁷ Hrvoje Skoko, *Upravljanje kvalitetom*, Sinergija, Zagreb, 2020.

⁸ Oksana Zhemchugova, Violetta Levshina, „The risk-based approach in organization quality management systems,“ *Revista galega de economía: Publicación Interdisciplinar da Facultade de Ciencias Económicas e Empresariais*, 2020, pp. 35-48.

⁹ Shahid Mahmood, Syed M. Ahmed, Panthi, Kamallesh, Nadeem Ishaque Kureshi, „Determining the cost of poor quality and its impact on productivity and profitability,“ *Built Environment Project and Asset Management*, 2014.

poor quality, or their unchanged level may indicate a problem related to an insufficient number of improvements in the system. Furthermore, if the costs of quality or their amount are perceived through external and internal, high external costs may indicate insufficient care of the organization related to the quality of products and services since any complaint or any remediation of the negative impact that the organization may have on the environment can be seen cost due to non-quality. If the organization has implemented one of the management systems but still has high costs due to poor quality, this may indicate insufficient efficiency of the management system, ie the need for improvements or control audit to identify the reason for the occurrence of costs.

2.2. Costs of quality and sustainability

Quality costs can have a significant impact on the sustainability of the system. If the costs of poor quality are considered in the context of the negative impact that the organization has on the environmental segment, or the negative impact on the social segment then any event that resulted in damage to society due to which the company had to allocate financial resources is it is considered a cost due to non-quality.¹⁰ On the other hand, the use of packaging or the generation of waste that must be separately disposed of, and for which it is necessary to allocate financial resources, undermines environmental sustainability. Thus, costs due to poor quality can undermine the sustainability of the system through the emergence of the need to invest the financial resources needed to mitigate the consequences of adverse events. On the other hand, the organization's concern for the prevention of events that may occur in the future, which involves investing in preventive measures or measures that will prevent negative impact on all components of sustainability is the cost of quality.¹¹

3. COSTS OF QUALITY IN TRANSPORT AND LOGISTICS

The costs of quality in transport and logistics can be seen as hidden costs and visible costs. Hidden costs are all dependent costs that may arise due to problems, ie non-compliance, while visible costs refer to all direct costs whose amount can be easily calculated. Table 1 shows examples of

¹⁰ Raine Isaksson, "Economic sustainability and the cost of poor quality," *Corporate Social Responsibility and Environmental Management*, 2005, pp 197-209.

¹¹ Andrea Schiffauerova, Vince Thomson, „Managing cost of quality: insight into industry practice," *The TQM Magazine*, Vol. 18 No. 5, 2006, pp. 542-550.

quality costs that may occur in transport and logistics. Table 1 shows that the costs of quality in logistics are partly determined by the costs that occur in transport, ie transport infrastructure. The reason for this primarily lies in the fact that distribution logistics uses transport infrastructure which, due to its congestion or poor quality, affects the performance of distribution logistics.

Table 1. Chategories of quality costs

Area	Category of costs that may be incurred
Traffic	Traffic accidents due to poor signaling
	Traffic accidents due to poor traffic management
	Traffic accidents due to dilapidated infrastructure
	The cost of remediation of the accident site
	The cost of emergency services going out on the field due to a traffic accident
	Cost due to traffic jams
	Cost of repairing injuries due to traffic accidents
Logistics	Cost due to delays caused by traffic jams
	Cost due to delays due to poor transport infrastructure
	Cost due to delays due to infrastructure works
	Cost due to delayed traffic accidents

Source: Author

Table 1 shows only some of the costs due to non-quality that may occur in the transport or logistics system. It should be emphasized that all costs that arise should be considered systematically. In other words, the poor quality of construction in the creation phase will result in the emergence of costs that may arise due to the need for works on transport infrastructure, traffic accidents due to poor traffic solutions, and others. Furthermore, each cost must be analyzed to take into account any related costs that may be incurred as described in expression 1.

$$Q_c = \sum_{k=1}^n Q_{Cn} \quad (1)$$

Where is:

- Q_c – cost due to non-quality
- Q_{cn} – any associated cost due to non-quality

In other words, the total cost due to non-quality is the sum of all related costs, direct and indirect, arising from non-compliance. In the context of transport and logistics, direct costs are the costs of delays, corrective actions and penalties for delays, while indirect costs are all costs related to repairing possible injuries that may occur due to insufficient security, infrastructure repair costs and all other costs of engaging employees in remediation or similar work.¹² However, the costs of quality can also be seen in the context of the organization of the transport business, or storage system. In other words, if the storage system is not well optimized, it can result in unfilled pallet spaces, and empty pallet spaces can result in costs resulting from the need to ensure all microclimatic conditions in the warehouse, the need to maintain storage space and other costs associated with the storage process. Furthermore, the cost due to poor quality within the storage system is a consequence of insufficient efficiency of commissioning, ie incorrectly performed commissioning. Incorrectly performed commissioning consequently results in the need to return the goods to the warehouse, ie the unavailability of the requested goods at the place where the goods were primarily sent.

On the other hand, if the costs of quality are seen in the context of prevention then any control carried out in the transport or logistics system can be considered as a cost for quality. However, the implementation of control slows down the flow of the system, ie slows down the movement of resources through the system, which leads to a decline in system efficiency and increased costs. This is also the reason why it is necessary to introduce a risk-based approach that can result in non-compliance, ie variability in the process. Furthermore, the risk-based approach is also the approach advocated by the ISO 9001:2015 quality management system standard. This approach implies the need to mitigate all the risks that can be identified in the transport or storage system, ie to define preventive measures that will not require significant controls that may result in a decline in efficiency.

Quality costs and their analysis are the basis for defining system improvements. High-quality costs, ie costs due to poor quality indicate the need to optimize the system as well as the implementation of system management policy. In other words, they indicate a lack of competence in system management as well as a lack of competence of employees involved in the process taking place in the system. Lower employee competence also results in a decline in the quality of management, since competence is one of the founda-

¹² P. Pudlo, Stanislav Szabo, „Logistic costs of quality and their impact on degree of operation level,“ *Journal of Applied Economic Sciences*, Vol. 9, No. 3, 2014, pp. 469-475.

tions of quality system management.¹³ However, it should be emphasized that competence should not be seen exclusively through the aspect of competence of people involved in the process, but must also be seen through the aspect of system competence since an insufficiently competent system can mean insufficient good adaptation of the system to the process. In other words, the technical, technological, structural and competence of human resources can reduce the risk of non-compliance, ie variability, which consequently results in less likely to incur costs due to poor quality.

Indicators depending on the cost to be considered can be used to identify the costs of quality in transport and logistics. Some of the indicators that can be taken into account when calculating the individual cost due to poor quality are shown in Table 2. Table 2 shows that the costs due to poor quality and quality costs in transport and logistics are seen as costs incurred in the system in relation to the total cost of the organization i.e. system. The higher the share of quality costs, the more developed the awareness of the importance of reducing the risk of non-compliance, and vice versa. Also, the higher the share of costs due to non-quality, the lower the quality of system management, ie the adaptation of the system to the function.

Table 2 shows only some of the indicators that can be used. Depending on the context of the system and the needs, other indicators can be created that will put different costs in the relationship. If we talk about the indicators in Table 2, represents the ratio of costs that occur due to incorrectly commissioned goods transported to the wrong customer and the total commissioning cost. The total cost of commissioning represents the cumulative costs of movement, working time, the cost of commission agents and all other dependent costs. Furthermore, shows the total cost of goods due to damage, which occurs due to insufficient protection of goods and the total cost of transport, which is cumulative of all dependent costs. shows the costs of remediation due to a traffic accident or other damage to the environment that needs to be repaired, which could have been prevented by preventive action and cumulative costs (dependent costs) that occur in transport. The last cost in Table 2 is the cost of movement or transport incurred due to insufficiently optimized transport routes and the total cost incurred in transport.

¹³ Larry Weinstein, Robert J. Vokurka, Gregory A. Graman, „Costs of quality and maintenance: Improvement approaches“, *Total Quality Management and Business Excellence*, Vol. 9, No. 5, 2009, pp. 497-507.

Table 2. Indicators for quality costs analysis

Indicator	Expression
Cost of commissioning of goods (T_k)	$T_k = \frac{\text{Cost of return of poorly commissioned goods}}{\text{Total cost of commissioning}} \times 100\%$
Cost of damage to goods in transport (T_o)	$T_o = \frac{\text{Cost of damage to goods}}{\text{Total cost of transport}} \times 100\%$
Accident remediation cost (T_s)	$T_s = \frac{\text{Cumulative remediation cost}}{\text{Cumulative transport costs}} \times 100\%$
Vehicle / employee movement cost (T_p)	$T_p = \frac{\text{Cumulative transport / movement cost}}{\text{Total transport / movement cost}} \times 100\%$

Source: Author.

The higher the share of costs classified as undesirable costs, which include unnecessary movements, unnecessary transport, rehabilitation costs, unused capacity costs, etc., the lower the quality of management, ie the higher the cost due to poor quality. Thus, there is a need to optimize the process and identify activities and risks that increase costs due to poor quality or may result in costs due to poor quality. For each of these activities or risks, it is necessary to define preventive measures, but it is necessary to take into account that the number of preventive measures is such that there is no reduction in the efficiency of the process as it does not significantly affect the cost.

Costs due to non-quality, ie quality can occur in each of the sub-processes, regardless of the process. It is necessary to look at them systematically, that is, to look at them through the prism of long-term consequences that may occur and that may have an impact on the environment. In other words, certain transport and logistics costs may occur after long-term exposure to environmental influences such as emissions from internal combustion engines, decomposition of landfilled packaging, production of all necessary resources used in construction or reconstruction. road infrastructure or transport and other means used in the transport and logistics process.

Considering the costs of poor quality and quality costs should change the management paradigm, ie it is necessary to change the paradigm of quality costs themselves and expand the time horizon they cover from short-term or current to long-term as it can affect sustainability and cover all components of sustainability, social, environmental and economic component..

4. CONCLUSION

Quality costs are costs that need to be considered in a systematic way, ie bearing in mind the long-term consequences that may occur for the system. Such costs are often hidden costs, ie they cannot be explicitly stated. When it comes to transport and logistics, insufficient capacity utilization, or insufficiently optimized transport or logistics processes can result in costs. In other words, if the organization does not fully use the capacity of the storage system or does not fully use the capacity of the means of transport, this may indicate insufficient management and may incur costs due to poor quality. On the other hand, costs that occur due to poor organization of transport or selection of itineraries, which results in increased transport costs can also be seen as a cost due to poor quality.

In other words, all unwanted costs that occur as a result of the insufficient organization or insufficient optimization of the process can be considered as a cost due to poor quality, ie the cost of poor management. However, it should be emphasized that the costs of poor quality do not always have to be seen through financial indicators but can also be seen through the decline in quality of life, slow provision of resources needed for normal functioning of city or organization functions, in charge of providing all the necessary resources for the normal functioning of the city or some other system.

The recommendation to future researchers in this field is to conduct research that would empirically calculate the costs of poor quality and compare the results obtained with the success of the organization. This approach could identify and prove how much the costs of poor quality can affect the quality of management, or increase in total costs in the organization.

Sažetak:

TROŠKOVI KVALITETE U LOGISTIČKIM I PROMETNIM PROCESIMA

Troškovi kvalitete sadržani su u svim troškovima s kojima se susreće organizacija. Oni mogu ukazati na nedovoljno dobru kvalitetu upravljanja, odnosno kompetentnost menadžmenta. Kao takvi, troškovi kvalitete mogu se podijeliti na unutarnje i vanjske, odnosno troškove koji se mogu identificirati u kratkom roku i troškove koji se mogu identificirati isključivo u dugom roku. Budući da su logistički i prometni procesi zaduženi za osiguranje svih potrebnih resursa za normalno funkcioniranje društva, pojava troškova zbog ne kvalitete, a koji su determinirani lošim mitigacijskim planovima mogu rezultirati i povećanjem ukupne cijene usluge, odnosno ukupne cijene koštanja proizvoda ili usluge. U ovom radu predstavljena je osnova

za analizu troškova zbog ne kvalitete kao i što je predložen sustavan način promatranja troškova. Stručni doprinos rada odnosi se na definiranje indikatora koje menadžment može koristiti prilikom analize uspješnosti upravljanja, dok se znanstveni doprinos odnosi na kreiranje temelja za drugačije sagledavanje troškova kvalitete kroz prizmu svih zavisnih troškova koji mogu nastati. Rad se temelji na provedenom sekundarnom istraživanju.

Ključne riječi: troškovi ne kvalitete, rizici, logistički procesi

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POST COVID-19 CHALLENGES AT AIRPORT OPERATIONS

POST COVID-19 IZAZOVI U RADU AERODROMA

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ABSTRACT

Coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is ongoing pandemic. Alpha, beta, gamma, delta and omicron variants of the SARS-CoV-2 coronavirus are classified as variants of concern. The situation across the globe was very unpromising until we got the vaccine, starting with Pfizer–BioNTech and Moderna vaccines, in December 2020. Until now, Coronavirus statistics are: cases 306 304,874, deaths 5,504,015, recovered 259,111,400. Counting vaccination, the score is: fully vaccinated (2 doses) 3.51 billion, at least 1 dose 4.34 billion. Economical impact by aviation subject: Airports – loss of approximately 64.6% of passenger traffic and 66.3% or over USD 125 billion airport revenues in 2020 compared to business as usual, Airlines – 65.9% decline of revenue passenger kilometres (RPKs, both international and domestic) in 2020 compared to 2019, Tourism – a decline in international tourism receipts of USD 1.3 trillion in 2020, compared to the USD 1.5 trillion generated in 2019, Trade – A fall of global merchandise trade volume by 5.3% in 2020 compared to 2019, Global economy – An estimated -3.2% to -3.5% contraction in world GDP in 2020. Traffic growth is in line with the Baseline scenario, which means recovery to the 2019 level by the end of 2023. The post-COVID-19 aviation will be focused on new business concepts and technologies, more low-cost oriented companies, cheaper tickets, together with

a worldwide immunity license, which can increase not only the safety of passengers and airlines but also the trust of destinations. Also as consequences of the pandemic, new societal behaviour arises, such as stay-at-home telecommunication vs. personal travel, crowd-reduction in public (and transportation systems), and the development of connected and automated processes. Technologies, such as biometrics, interactive navigation, and artificial intelligence offer contactless and touchless solutions and are therefore just as relevant in the post-COVID-19 world. Technologies are also expected to play a key role in helping to improve the financial health and viability of airports experiencing long-term reductions in traffic as a result of COVID-19.

Keywords: COVID-19, self-service, biometrics, contactless technology.

1. INTRODUCTION

The COVID-19 pandemic, also known as the coronavirus pandemic, is an ongoing pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It was first identified in December 2019 in Wuhan, China. The World Health Organization declared the outbreak a Public Health Emergency of International Concern in January 2020 and a pandemic in March 2020.¹

As time is rolling up, we have to face variants of the SARS-CoV-2. Alpha, beta, gamma, and delta variants of the SARS-CoV-2 coronavirus are classified as variants of concern. On Nov 25, 2021, about 23 months since the first reported case of COVID-19, a new SARS-CoV-2 variant of concern (VoC), omicron, was reported.²

Most COVID-19 vaccines have remained effective in preventing severe COVID-19, hospitalisation, and death, for all previous variants. At the beginning of 2021, when the intensive vaccination operation began, there was a big dilemma about the safety of the offered vaccines, approvals for the use of these vaccines (especially Chinese and Russian manufacturers), and especially the side effects and reactions of different populations and groups of citizens with certain health problems (pregnant women, patients with a problem with blood components). Globally, there have been 267,865,289 confirmed cases of COVID-19, including 5,504,015 deaths, reported to WHO.^{3,4}

¹ https://en.wikipedia.org/wiki/COVID-19_pandemic, accessed on 10.01.2021

² Salim S. Abdool Karim, Quarraisha Abdoo Karim, „Omicron SARS-CoV-2 variant a new chapter in the COVID-19 pandemic“, *www.thelancet.com*, Vol 398, December 11, 2021

³ WHO – World Health Organization

⁴ <https://covid19.who.int/>, accessed on 12.12.2021 10:22

Tablica 1. Vaccination against COVID-19 started in 218 locations⁵ and as result we have

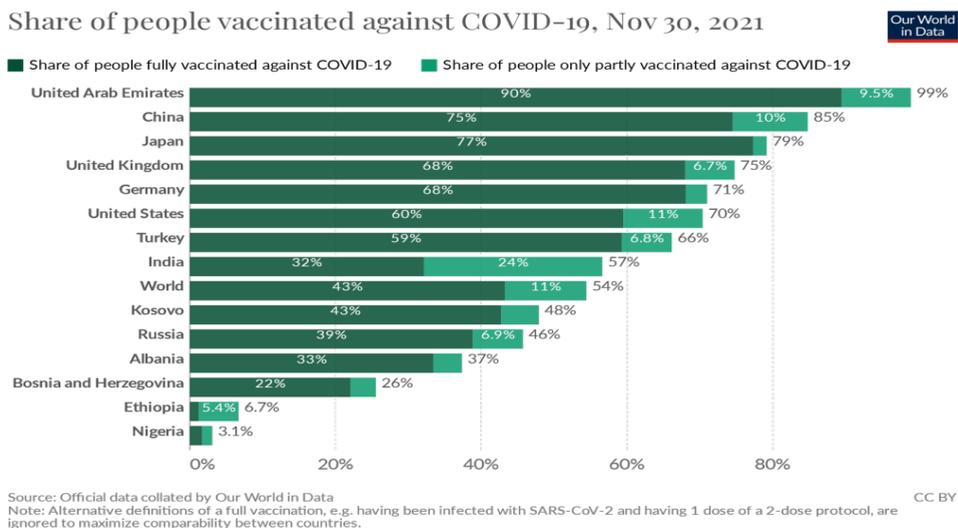
Location	Doses given	Fully vaccinated (% of the population)	At least 1 dose (% of the population)
Worldwide	8.24 billion	3.51 billion (44.55%)	4.34 billion (55.17%)

Source: ICAO Vaccination Report 1207, decembar 2021.

Looking worldwide picture is not the same. Some regions and countries have good results, some are very poor in vaccination.

In this crises period, domestic traffic was the key driver behind the industry-wide improvement.

Figure 1. The worldwide share of people vaccinated against COVID-19



Source: Our World in Data, accessed on 25.12.2021 11:00

⁵ ICAO Vaccination Report 1207, decembar 2021.

Russia remained the fastest growing key domestic market for the ninth consecutive month (+29% vs. 2019), benefitting from booming domestic tourism and relatively loose travel restrictions on domestic routes.⁶

2. CONSEQUENCES OF PANDEMIC COVID-19

The COVID-19 virus has spread worldwide without acknowledging borders. It has impacted all industries, all sectors and all aspects of our lives with devastating economic and financial losses and significant uncertainties. Particularly great consequences were recorded in the field of aviation, with airlines and airports being particularly affected. The schedule and consequences of a pandemic vary by region and country, as well as the date of the increase and decrease of the pandemic and the measures applied. ICAO⁷ is working alongside the ACI⁸ in monitoring the developments and leveraging their expertise and analysis conducted on the economic impacts of COVID-19 on airports.⁹

2.1. Travel restriction

Travel restrictions regarding air travel have played a positive role in delaying the pandemic progression by slowing the spread. As individual countries control their respective pandemic outbreaks, domestic traffic has seen the largest recovery. Aviation hubs with low/no domestic traffic, thus, faced the most severe consequences of the pandemic primarily due to closed borders, travel restrictions, quarantine rules, and associated demand loss.¹⁰

⁶ Ibid.

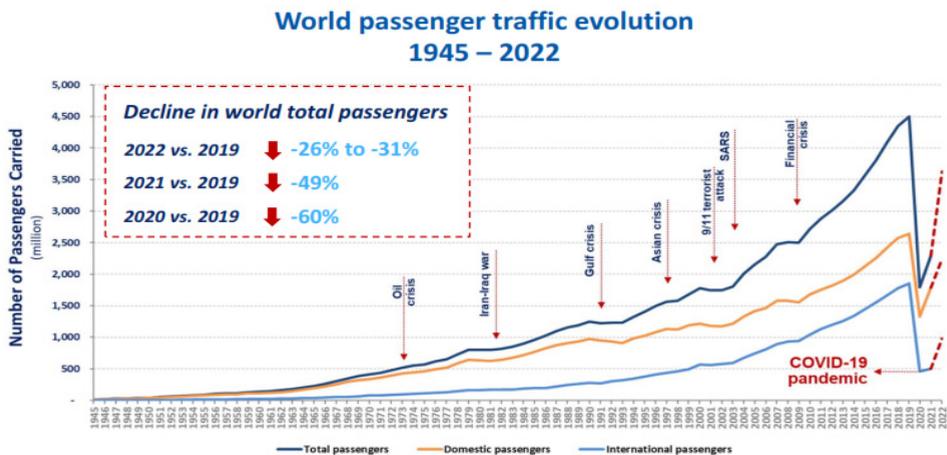
⁷ ICAO – International Civil Aviation Organization.

⁸ ACI – Airport Council International.

⁹ <https://www.icao.int/sustainability/Pages/Economic-Impacts-of-COVID-19.aspx>, Accessed 25.12.2021 18:34

¹⁰ Mohit Arora, et al. „Airport pandemic response: An assessment of impacts and strategies after one year with COVID-19“, *Transportation Research Interdisciplinary Perspectives*, Elsevier BV, 11, 2001.

Figure 2. World passenger traffic evolution



Source: ICAO COVID 2021 12 21 Economic Impact.

Different driving factors led to varied recovery curves across specific countries and continue to influence global recovery. Countries with more severe COVID outbreaks, including Spain, Italy, UK, United States and India, enforced strict lockdowns and domestic aviation capacity restrictions which affected the operations and recovery. Further, the differences between the patterns and numbers of new COVID-19 cases show that multiple factors determine the spread within a country.¹¹

The introduction of travel bans has slowed down the spread of the infection, but complete closure (although there have been such examples) is questionable in terms of efficiency as well as the possibility of realizing all the necessary functions of a society. Some research has indicated a negligible effect of **travel bans**, and other studies have suggested a delay in disease spread and case numbers, albeit with a recognition that complete travel bans are unlikely to be sustainable in the longer term.¹²

¹¹ Ibid.

¹² Michel Bielecki, et al., “Air travel and COVID-19 prevention in the pandemic and peri-pandemic period: A narrative review”, *Travel Medicine and Infectious Disease*. Elsevier, 2021.

2.2. Quarantine

Quarantine (the restriction of asymptomatic healthy people who may have had exposure to an infectious disease) after travel is one of the oldest, public health tools known. In the context of COVID-19, a quarantine is important in reducing incidence and mortality, and early implementation combined with other public health measures is important to ensure effectiveness. The quarantine of travellers from a country with a declared outbreak may delay its introduction or re-introduction or may delay the peak of transmission, or both, but the effect was small, and their confidence in the results was low or very low due to the limitations in the evidence available.

Figure 3. Scheduled weekly flight capacity

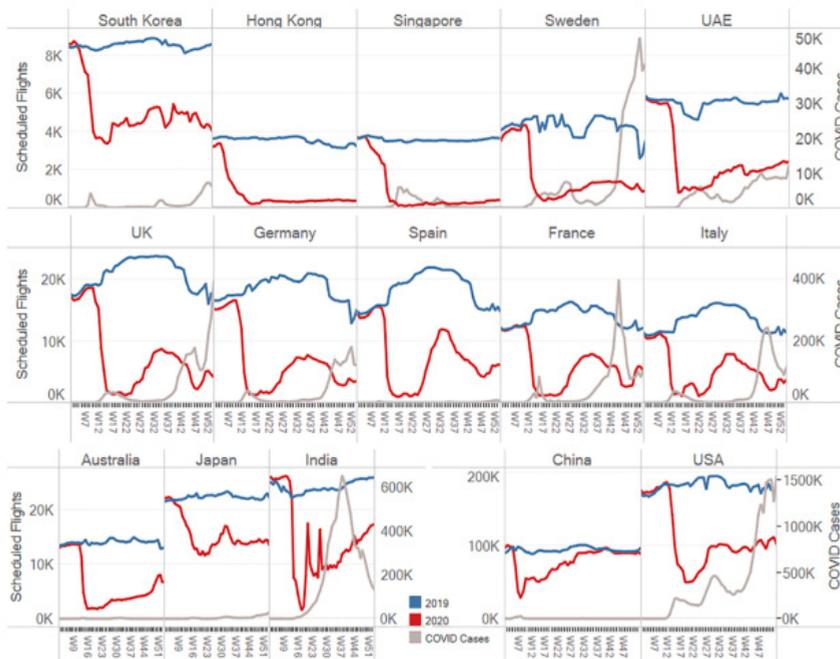


Fig. 2. Scheduled weekly flight capacity across selected countries during 2019 (Blue) and 2020 (Red) with weekly new COVID cases (Data from OAG, JHU). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Source: OAG¹³

¹³ OAG – Official Aviation Guide of the Airways

2.3. COVID-19 tests

COVID-19 tests are important for aviation because with this measure air carriers try to reestablish confidence in air travel. There are three main ways to establish infection with SARS-CoV-2:

- Nucleic acid tests to detect the presence of RNA, either via RT-PCR or LAMP.
- Antigen testing for the presence of a viral antigen, usually a surface protein.
- Antibody tests to detect prior infection using ELISA or LFA assays.

2.4. Economical implications

The COVID-19 virus has spread worldwide. It has impacted all industries, all sectors and all aspects of our lives with devastating economic and financial losses and significant uncertainties.¹⁴

The COVID-19 impact on world scheduled passenger traffic for the year 2020 compared to 2019 levels:

- Overall reduction of 50% of seats offered by airlines;
- Overall reduction of 2,699 million passengers (-60%).
Approx. USD 371 billion loss of gross passenger operating revenues of airlines

The COVID-19 impact on world scheduled passenger traffic for the year 2021 (preliminary estimates), compared to 2019 levels:

- Overall reduction of 40% of seats offered by airline;
- Overall reduction of 2,206 to 2 237 million passengers (-49% to -50%);
- Approx. USD 323 to 327 billion loss of gross passenger operating revenues of airlines.

The economical implications of the pandemic directly affect the **workforce employed** in the industry. Terminal closures and flight suspension as well as health risks in the case of a pandemic thus affected many more than those directly employed. Many reports only highlight major airlines' staff job losses which is a fraction of the overall employment numbers in jeopardy. Beyond the directly associated air transportation jobs, the millions of jobs at stake are from aviation-dependent fields such as tourism in general, e.g. hotel staff, catering, retail at airports, private-hire drivers, and car rental services.

¹⁴ <https://www.icao.int/sustainability/Pages/Economic-Impacts-of-COVID-19.aspx>. Accessed 28.11.2021 10:34

The IATA expects over 25 million direct and indirect jobs at high risk due to airline shutdowns.¹⁵

The pandemic has also affected aviation-related **capital investment** schemes, airport expansion programs and upcoming new projects which have been put on hold, with direct economic consequences to the construction industry. Economical impact by **aviation subject**:¹⁶

1. Airports: An estimated loss of approximately 64.6% of passenger traffic and 66.3% or over USD 125 billion airport revenues in 2020 compared to business as usual (by ACI).
2. Airlines: A 65.9% decline of revenue passenger kilometres (RPKs, both international and domestic) in 2020 compared to 2019 (by IATA).
3. Tourism: A decline in international tourism receipts of USD 1.3 trillion in 2020, compared to the USD 1.5 trillion generated in 2019 (by UNWTO).
4. Trade: A fall of global merchandise trade volume by 5.3% in 2020 compared to 2019 (by WTO).
5. Global economy: An estimated -3.2% to -3.5% contraction in world GDP in 2020, far worse than during the 2008–09 financial crisis (by IMF and World Bank).

Economic impacts threaten to undo decades of recent progress in poverty reduction, child nutrition and gender equality and exacerbate efforts to support refugees, migrants, and other vulnerable communities. Economic recovery efforts are also increasingly urgent as the world begins to pivot to a “post-pandemic” reality.¹⁷

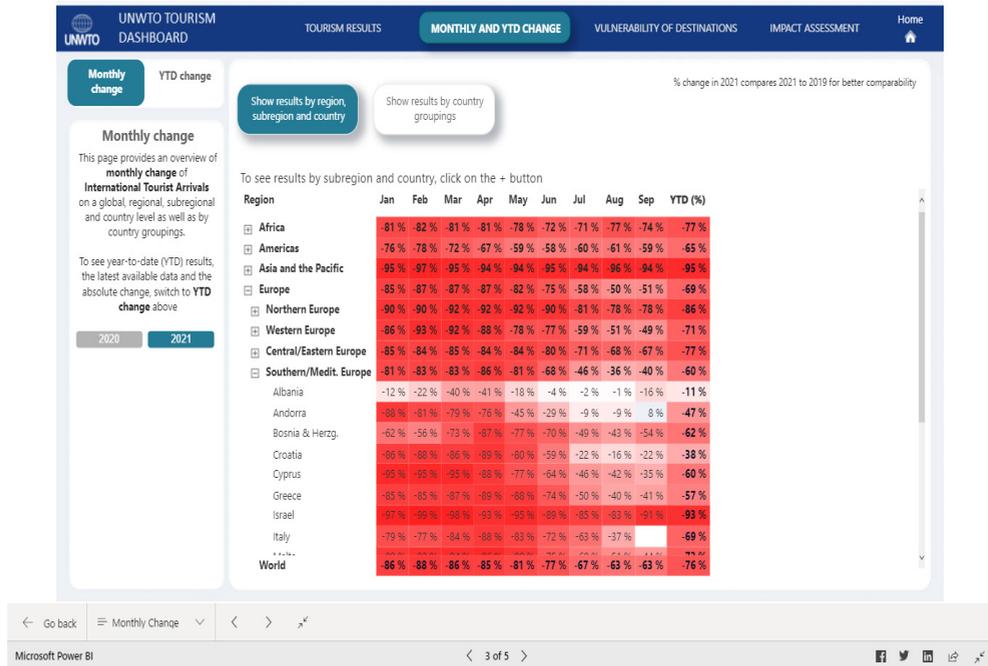
One of the industries that rely most heavily on aviation is tourism. By facilitating tourism, air transport helps generate economic growth and alleviate poverty. As threshold, in 2019 approximately 1.4 billion tourists are crossing borders every year, over half of whom travelled to their destinations by air. The picture below it is compared some countries in Europe with the rest of the world. Here we can see the difference in the approach to the fight against the pandemic, which has a direct consequence on certain industries, in this case, tourism.

¹⁵ Mohit Arora, et al. „Airport pandemic response: An assessment of impacts and strategies after one year with COVID-19“, *Transportation Research Interdisciplinary Perspectives*, Elsevier BV, 11, 2021.

¹⁶ International Civil Aviation Organization (ICAO), COVID 2021 12 21 Economic Impact, Montréal, Canada, Dec 2021

¹⁷ The Committee for the Coordination of Statistical Activities (CCSA), How COVID-19 is changing the world: A statistical perspective Volume III, Mar 2021.

Figure 4. International tourist by regions in 2021



Source: <https://www.unwto.org/international-tourism-and-covid-19> Accessed 26.12.2021 11:21

We should not ignore the fact that tourism is a key industry for some countries, so measures to combat the pandemic have been designed to protect the season (Austria for the winter season 2020/2021, Croatia for the summer season 2021).

3. WORKING IN A PANDEMIC AND THE ROAD TO RECOVERY

The difference between domestic and international traffic recovery illustrates the key challenge to global air traffic recovery – government restrictions and controls on international travel. As of July 2021, UN WTO¹⁸ reported that 29% of destinations worldwide remained completely closed to tourists, 34% had partially closures and 36% required negative COVID-19 test results upon arrival (sometimes combined with quarantine require-

¹⁸ UN WTO – United Nations World Tourism Organization.

ments)¹⁹. There are considerable regional differences – 70% of Asia Pacific destinations remained closed compared with 20% in the Americas and 13% in Europe. The UN WTO reported that only three countries had no COVID restrictions on international travel – Albania, Costa Rica and the Dominican Republic. The issue for travellers is not just restrictions at the destination but also restrictions imposed on outbound travel in their home countries, with some destination countries red-listed or travellers requiring testing and quarantining upon return.²⁰

Travel restrictions are being lifted (or reduced) as vaccination programmes in some countries have reduced the spread and severity of the virus. However, there is still some way to go before the situation resembles “back to normal”. As the IATA²¹ has pointed out, there is a lack of agreement between countries on the recognition of vaccines approved by the WHO, traveller testing requirements and documentation to certify full vaccination. A further challenge is that vaccination rates vary considerably across the globe – in Europe 53% of the population is fully vaccinated, while North America has a similar rate of 48%, but in Asia, the figure is 38% and in Africa, only 4.6% have been fully vaccinated.²²

3.1. The road to recovery

Although the largest vaccination campaign in history is well underway, a large proportion of the world’s population – mainly in emerging and developing countries – remains unvaccinated. While positive signs of recovery can be seen, recovery could be erased by the emergence of a new variant of the COVID-19 virus that makes vaccines ineffective – returning the industry, and the world, back to square one.²³

Current traffic growth is in line with the Baseline Scenario²⁴, recovery to 2019 level by end 2023:

- Vaccine roll-out reaching herd immunity levels within Europe;
- Reliable vaccine (also against variants);
- Limited travel restriction;

¹⁹ <https://www.unwto.org/news/vaccines-and-digital-solutions-to-ease-travel-restrictions>. Accessed 29.11.2021 19:15

²⁰ <https://ourworldindata.org/covid-vaccinations>. Accessed 29.11.2021 19:25

²¹ IATA – International Air Transport Association.

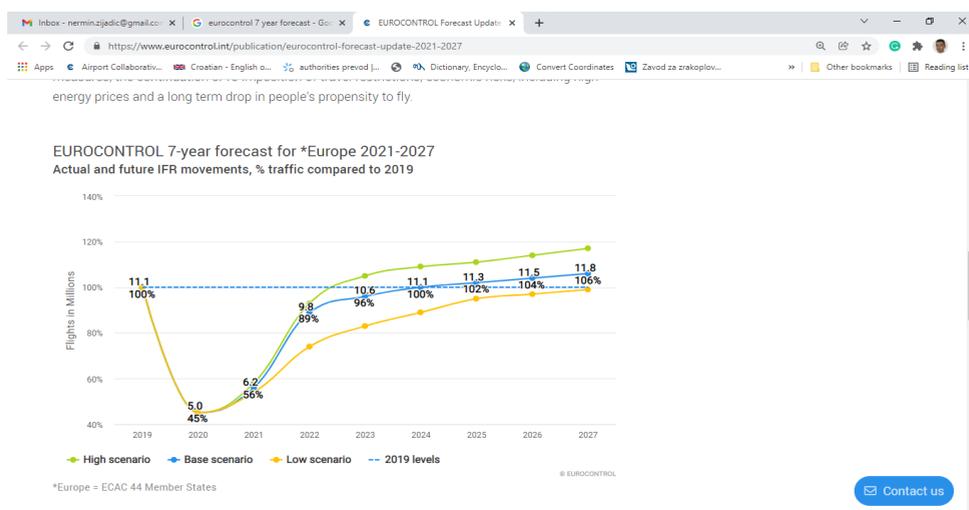
²² Ibid.

²³ <https://aci.aero/2021/11/01/the-impact-of-covid-19-on-the-airport-business-and-the-path-to-recovery-3/>. Accessed 28.11.2021 21:25

²⁴ <https://www.eurocontrol.int/publication/eurocontrol-forecast-update-2021-2027> Accessed 26.12.2021 16:25

- Coordinated European approach;
- North-Atlantic flows restarting during November 2021, Middle-East Q1 2022, Asia-Pacific/India Q3 2022, Australia flows Q4 2022;
- Relatively good passenger confidence;
- Savings glut/Pent-up demand;
- Business travel return to pre-COVID19 levels in 2023;
- Airports well able to bring back capacity.

Figure 5. EUROCONTROL 7-year forecast for ECAC Europe 2021-2027
Actual and future IFR movements, % traffic compared to 2019



Source: <https://www.eurocontrol.int/publication/eurocontrol-forecast-update-2021-2027> Accessed 26.12.2021 16:25

For 7 year forecast, 2019 traffic will be achieved in 2024.

3.2. Economic Performance of the Airline Industry²⁵

Following the worst year on record for the aviation industry (66% decline in global RPKs), the recovery in traffic has been slow in 2021 due to international travel restrictions.

²⁵ <https://www.iata.org/en/iata-repository/publications/economic-reports/airline-industry-economic-performance---october-2021---report/>, Assesed 18.12.2021 20:14

Table 2. Worldwide data for the airline industry

Worldwide Airline Industry	2019	2020	2021E	2022F
Spend on air transport*, \$billion	876	384	487	658
% change over year	3.6%	-56.1%	26.5%	35.2%
% global GDP	1.0%	0.4%	0.5%	0.6%
Return fare, \$/pax. (2018\$)	310	242	214	228
Compared to 1998	-62%	-70%	-74%	-72%
Freight rate, \$/kg (2018\$)	1.79	2.71	3.00	2.67
Compared to 1998	-65%	-47%	-41%	-48%
Passenger departures, million	4,543	1,807	2,277	3,432
% change over year	3.8%	-60.2%	26.0%	50.7%
RPKs, billion	8688	2965	3498	5283
% change over year	4.1%	-65.9%	18.0%	51.0%
CTKs, billion	254	232	274	288
% change over year	-3.2%	-8.7%	18.2%	4.9%
World GDP growth, %	2.4%	-3.6%	5.8%	4.1%
World trade growth, %	0.3%	-5.1%	9.5%	5.6%

Source: International Air Transport Association (IATA), Economic Performance of the Airline Industry, 2021 End-year report, Oct 2021.

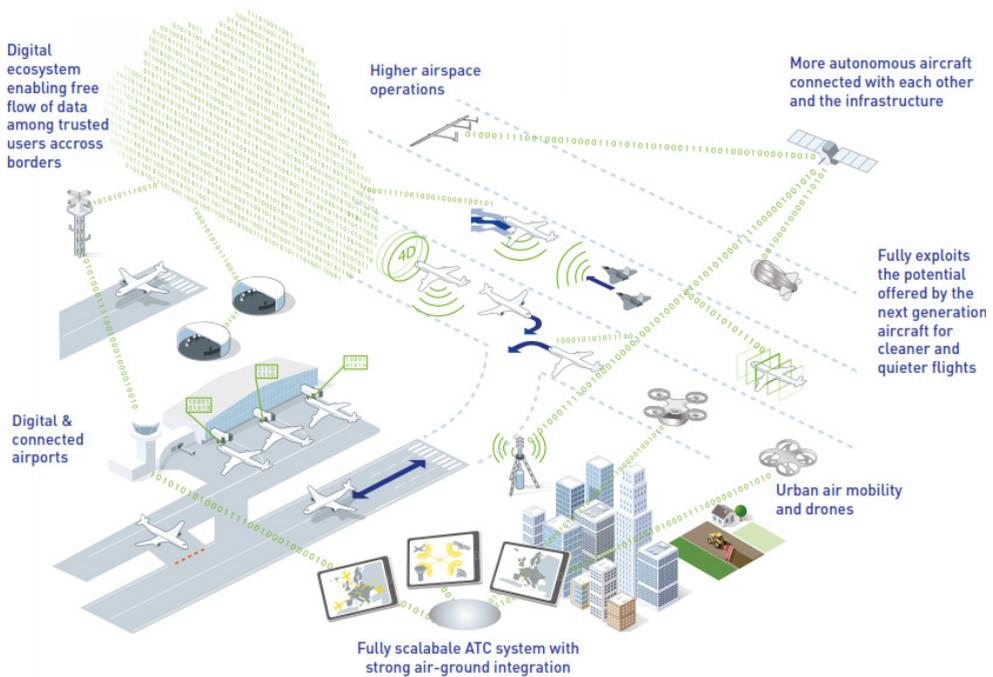
Note: GDP = Gross domestic product, RPK = Revenue Passenger Kilometers, CTK = Cargo Tonne Kilometres.

However, consumer confidence rebounded following the lockdown period last year and the accumulated income of consumers supported domestic travel recovery.

4. TRENDS IN AVIATION IN GENERAL AND IMPLICATIONS CAUSED BY COVID-19 AT AIRPORTS

The digital European sky leverages the latest digital technologies to transform Europe's aviation infrastructure enabling it to handle the future growth and diversity of air traffic safely and efficiently while minimising environmental impact. This transformation centres on technologies that can increase the levels of automation, cyber-secure data sharing and connectivity. In doing so, these technologies enable the system to become more modular and agile, while building resilience to disruptions, traffic growth and diversity of air vehicles.²⁶

Figure 6. Digital European sky



Source: SESAR Joint Undertaking, Digital European Sky, 2019.

²⁶ SESAR Joint Undertaking, Digital European Sky, 2019.

The world of aviation is changing. Aircraft are becoming more autonomous, more connected, more intelligent, and more diverse. Air passengers increasingly expect eco-friendly, smart and personalised mobility options that allow them to travel seamlessly and efficiently.

They want quick and reliable data to inform their travel choices, not only on schedules, prices and real-time punctuality but increasingly also on environmental impacts. To deliver this new era in aviation, leveraging technology is key.²⁷

4.1. Future trends and challenges on aviation

The post-COVID-19 aviation will be focused on new business concepts and technologies, more low-cost oriented companies, cheaper tickets, together with a worldwide immunity license, which can increase not only the safety of passengers and airlines but also the trust of destinations. Also as consequences of the pandemic, new societal behaviour arises, such as stay-at-home telecommunication vs. personal travel, crowd-reduction in public (and transportation systems), and the development of connected and automated processes.

The pandemic provides an unprecedented chance for rethinking and remodelling global transportation and considering the opportunity of a reboot. Accordingly, there are plenty of opportunities for building future transportation and mobility concepts, which are not only pandemic-safe but also sustainable.²⁸

Technologies, such as biometrics, interactive navigation, and artificial intelligence offer contactless and touchless solutions and are therefore just as relevant in the post-COVID-19 world. Technologies are also expected to play a key role in helping to improve the financial health and viability of airports experiencing long-term reductions in traffic as a result of COVID-19.

4.2. Touchless technologies at airports

By introducing new processes and routines across the activities at airports to minimize face-to-face contact, airlines seek to provide greater confidence to travellers about their security and safety measures. Although airlines

²⁷ Ibid

²⁸ Thomas Budd, et al. “An assessment of air passenger confidence a year into the COVID-19 crisis: A segmentation analysis of passengers in Norway”, *Journal of Transport Geography*, Pergamon, 96, 2021.

have historically been using technology to allow check-in and self-scanning of boarding pass for some time, this advances this direction of travel. Indeed, many operators view reducing touchpoints as one of the most effective ways of curtailing the spread of the virus whilst at the same time harnessing the latest technologies to improve their processes.²⁹

United Airlines has now installed touchless baggage check-in at all of the U.S. airports in which it owns kiosks. That's about 220 airports. Passengers print bag tags by scanning a mobile or printed boarding pass at a self-service check-in kiosk without touching the screen. It works by a software update to United's existing self-service kiosks. Before using the kiosks passengers have to check in and pay any baggage charges. They also have to get their boarding pass, mobile or paper, before using the kiosk. They can then scan the mobile or printed boarding pass in a slot just below the kiosk screen. The kiosk then prints the bag tags automatically. Passengers then take their bags to the bag drop as usual. The kiosk prints bag tags associated with the name on the boarding pass. So other passengers in a group will have to scan their boarding passes as well.³⁰

4.3. Biometric check-in

The positive effects of COVID-19 are illustrated by the introduction of the accelerated use of biometric technology. Biometric data encompassing iris scans and fingerprints have proven to be generally effective in verifying one's identity. In the wake of the pandemic with potential transmission through touch, the biometric boarding process (where facial recognition is used to confirm passenger identity) replaces the conventional manual check of documents and passports.

Biometric facial identification technology enables passengers to flow seamlessly through airport touchpoints that are susceptible to long queues. After passenger identify is verified at their first touchpoint, their travel documents no longer need to be presented – their face has become their boarding pass. The passenger is happier, security is strengthened and operations are more cost-effective throughout the terminal.³¹

²⁹ Joseph Amankwah-Amoah, "COVID-19 pandemic and innovation activities in the global airline industry: A review", *Environment International*, Pergamon, 156, 2021.

³⁰ <https://www.passengerselfservice.com/2020/06/united-touchless-bagtag-printing-now-in-use-at-most-us-airports/> Accessed 30.Dec.2021 15:14

³¹ <https://www.collinsaerospace.com/what-we-do/Airports/Passenger-Facilitation/Arinc-Biometrics-Services> Accessed 30.Dec.2021 15:29

From a **management perspective**, it is a complex and difficult task. We have to offer technological solutions for passengers that want them, and manual processes for those who prefer more traditional approaches. An example of this is check-in, where it is common to see staffed check-in desks, at the same time it could be self-service kiosks, bag-drops and/or entirely mobile paperless processes in the same airport.

While this helps to meet the needs of different groups, it results in multiple ways of conducting the same process. This can lead to inefficiencies, inconsistent service levels and confusion among passengers, especially when processes vary according to the airport or even between different airlines at the same airport.

The extent to which airports will be able (or willing) to continue to accommodate diverse passenger expectations in this way will likely depend on several factors, both internal and external. An airport will look to its current and/or desired passenger mix and market position to guide investment decisions on technology adoption. For example, it could be expected that a large hub airport with a strong focus on business traffic, where speed and reliability of the passenger experience are likely to be valued more highly, would seek to adopt digital technologies more readily than a smaller regional airport focussing on seasonal leisure traffic. It is possible that airport business models, and the services they offer, will become more diversified as result.

For some airports, especially those catering to particular passenger segments, promoting a more ‘traditional’, ‘humanised’ approach to the passenger experience. There are examples of this trend in other sectors including insurance, banking and sales, where the ability to speak to a real person is widely seen as a valuable and marketable commodity. To make the best possible investment decisions, airports need to know and understand the preferences of their passengers.

According to IATA, 2020 marked the worst year in the history of the aviation industry. While many players in this sector are still emerging from the chaos reaped by COVID, the crisis has accelerated and demanded technological changes that address the critical issues the industry faces in a post-COVID world.³²

The aviation industry has had no choice but to adapt to the “new normal.” Concerning airports, this has led to making everything as **contactless** and **digital** as possible.

³² <https://www.networkcablingservices.com/9-it-trends-shaping-the-aviation-industry-in-2021/> Accessed 29.11.2021 19:45

For example, many airports have already revolutionized the check-in process to minimize human-to-human interaction. Today, at many airport locations, automated kiosks have taken the place of traditional check-in desks, and digital signage helps guide customers through the boarding process. Other examples of increased digitization include security clearance and advanced object and body scanning technology, paperless boarding passes, and automated boarding process. These are all linked via IoT³³ protocols and analyzed and deciphered by AI³⁴ and ML³⁵.

The entire aviation industry, like many others, is moving to the **cloud**. Not only does this help to reduce the most-criticized carbon footprint, but it also delivers many other benefits. Firstly, cloud-based networks will serve as the infrastructure for IoT-enabled devices that are being installed across airports. The ability to track the passenger right through the check-in and boarding process autonomously provides several advantages, such as improved security. Secondly, airports are costly operations themselves. Even just the slightest efficiency saving provided by IoT-enabled sensor-based PoE³⁶ lighting can deliver considerable cost reductions.

All these connected devices (along with the data they send to the cloud) will also provide the basis for **artificially intelligent** algorithms to sift through trillions of terabytes of data to unearth meaningful operational insights. Airports may use **machine-learning**-based algorithms to deliver insights into

³³ The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

³⁴ Artificial Intelligence (AI) is intelligence demonstrated by machines, as opposed to natural intelligence displayed by animals including humans. It could be defined as: any system that perceives its environment and takes actions that maximize its chance of achieving its goals. Some popular accounts use the term “artificial intelligence” to describe machines that mimic “cognitive” functions that humans associate with the human mind, such as “learning” and “problem solving”.

³⁵ Machine Learning (ML) is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it to learn for themselves.

³⁶ Power over Ethernet (POE) is a technology that lets network cables carry electrical power. VoIP phones - the original POE application. Using POE means phones have a single connection to a wall socket, and can be remotely powered down, just like with the older analog systems. IP cameras - POE is now ubiquitous on networked surveillance cameras, where it enables fast deployment and easy repositioning. Wireless - WiFi and Bluetooth APs and RFID readers are commonly PoE-compatible, to allow remote location away from AC outlets, and relocation following site surveys.

retail spending, security processes, travel patterns, bathroom facilities, parking, check-in habits, and much more. Such a wide-ranging analysis can only be carried out simultaneously with the help of AI-based programs and ML algorithms.

While vaccination campaigns are making inroads against the threat posed by the virus, **social distancing** will remain for the foreseeable future. Airports have been one of the most visible proponents of social distancing tech. Camera-enabled crowd-density monitors already help to control passenger flows through high-traffic areas. In other cases, radar and 3D sensors have been repurposed to improve physical distancing and manage people flows across terminals. Other social distancing tech being introduced to airports across America include virtual queuing, security checkpoint reservations, and “bingo boarding,” which all help to reduce crowding at the traditional bottlenecks along the passenger journey. These innovations will prove crucial once passenger numbers return to what the figures were before the pandemic while the threat of the virus remains.

One of the customer preference trends is **In-Flight Connectivity**. In-flight entertainment is one of those fields. This includes systems with hundreds of movies and TV shows to choose from, smartphone and tablet compatibility (including USB-C charging), interactive maps, surround-sound audio, and of course, in-flight wireless connectivity.

A critical element of smart airports will come in the form of **advanced self-service** and **biometrics** technology. The new service means customers in the Star Alliance ‘frequent flyer’ scheme can opt to enrol into the biometric programme for all their future trips through the company’s app. To use it, passengers take a selfie on their phones and scan a valid form of travel identification. The app then verifies the validity of the identification document against the selfie to prevent fraud. The passenger’s photograph is encrypted, with the resulting biometric template stored in a central database in the Azure cloud. Star Alliance then matches the frequent flyer customer number against their reservations list and when the system detects that the customer is flying, the biometric template is made available for that specific date and airport only.³⁷

³⁷ <https://techmonitor.ai/emerging-tech/start-alliance-biometrics-lufthansa>
Accessed 31.12.2021 11:21

Figure 7. Lufthansa biometrics



Source: <https://techmonitor.ai/emerging-tech/start-alliance-biometrics-lufthansa> Accessed 31.12.2021 11:21

Once there has been a match with the identification, the biometric or facial recognition serves as the boarding pass without the need to show a physical document.

Futuristic self-service concepts cannot function without **contactless technology** such as NFC³⁸ and RFID³⁹. They have a pivotal role to play as airports seek to reduce the number of physical interactions and checkpoints in the passenger journey.

By the end of this year, most US airports will incorporate contactless technology, particularly during check-in and security processes. But it goes beyond that. Contactless technology will shortly penetrate almost all aspects of flying, including how we pay for items, how we board a plane, and how we interact with in-flight entertainment systems.

Perhaps the most intriguing development is the current rollout of Amazon's Just Walk Out technology across many airports, which eliminates the need for retail interactions altogether.

³⁸ NFC – Near-Field Communication.

³⁹ RFID – Radio-frequency Identification.

5. CONCLUSION

The pandemic of COVID-19 is still ongoing, with new variants. Although we have the vaccine, pandemic cause a huge break in aviation and all other aspects for humans. Consequences of the pandemic are unprecedented if we measure with the number of passengers, in 2020 decline 60%, in 2021 decline 49%, in 2022 prediction is decline 30% comparing with 2019. This period is marked with travel restriction, travel ban, quarantine and in the absence of any international consensus this means that approaches and how it is implemented (voluntary/mandated, home/government facility, individual/group etc) vary from country to country. Recovery is regionally different, 29% of destinations worldwide remained completely closed to tourists, 34% had partial closures and 36% required negative COVID-19 test results upon arrival (sometimes combined with quarantine requirements).

The world of aviation is changing. Aircraft are becoming more autonomous, more connected, more intelligent, and more diverse. Air passengers increasingly expect eco-friendly, smart and personalised mobility options that allow them to travel seamlessly and efficiently. They want quick and reliable data to inform their travel choices, not only on schedules, prices and real-time punctuality but increasingly also on environmental impacts.

The pandemic provides an unprecedented chance for rethinking and remodelling global transportation and considering the opportunity of a reboot. Technologies, such as biometrics, interactive navigation, and artificial intelligence offer contactless and touchless solutions and are therefore just as relevant in the post-COVID-19 world. Many different tools are available, such as self-check-in and biometric check-in, touchless baggage check-in, self-scanning of boarding passes, mobile payment, in-flight connectivity and contactless technology such as NFC and RFID. Apart from technology we have to think about humans. We have to offer technological solutions for passengers that want them, and manual processes for those who prefer more traditional approaches. An airport will look to its current and/or desired passenger mix and market position to guide investment decisions on technology adoption.

Sažetak:

POST COVID-19 IZAZOVI U RADU AERODROMA

Pandemija COVID-19 i dalje traje, sa novim varijantama. Iako imamo vakcinu, pandemija je izazvala veliki prekid u avijaciji i svim drugim aspektima za ljude. Posljedice pandemije su bez presedana ako mjerimo brojem putnika, 2020. pad 60%, 2021.

pad 49%, 2022. predviđanje je pad 30% u odnosu na 2019. Ovaj period obilježavaju ograničenja putovanja, zabrana putovanja, karantena i u nedostatku bilo kakvog međunarodnog konsenzusa, to znači da se pristupi i način na koji se implementira (dobrovoljni/nadležni, domaća/vladina ustanova, pojedinac/grupa itd.) razlikuju od zemlje do zemlje. Oporavak je regionalno različit, 29% destinacija širom svijeta ostalo je potpuno zatvoreno za turiste, 34% je djelimično zatvoreno, a 36% je tražilo negativne rezultate testa na COVID-19 po dolasku (ponekad u kombinaciji sa zahtjevima karantina). Svijet avijacije se mijenja. Zrakoplovi postaju autonomniji, povezaniji, inteligentniji i raznovrsniji. Putnici u zračnom prometu sve više očekuju ekološki prihvatljive, pametne i personalizirane opcije mobilnosti koje im omogućavaju da putuju neprimjetno i efikasno. Oni žele brze i pouzdane podatke kako bi informirali svoje izbore putovanja, ne samo o rasporedu, cijenama i tačnosti u realnom vremenu, već sve više i o utjecajima na okoliš. Pandemija pruža šansu bez presedana za ponovno promišljanje i preuređenje globalnog transporta i razmatranje mogućnosti ponovnog pokretanja. Tehnologije, kao što su biometrija, interaktivna navigacija i umjetna inteligencija, nude bezkontaktna rješenja i stoga su jednako relevantne u svijetu nakon COVID-19. Dostupni su mnogi različiti alati, kao što su samoprijava i biometrijska prijava, bezkontaktna prijava prtljage, samostalno skeniranje boarding karata, mobilno plaćanje, povezivanje u letu i bezkontaktna tehnologija kao što su NFC i RFID. Osim tehnologije, moramo misliti i na ljude. Moramo ponuditi tehnološka rješenja za putnike koji ih žele, a ručne procese za one koji preferiraju tradicionalnije pristupe. Aerodrom će gledati na svoju trenutnu i/ili željenu mješavinu putnika i tržišnu poziciju kako bi vodio investicijske odluke o usvajanju tehnologije.

Ključne riječi: samoposluga, biometrika, bezkontaktna tehnologija.

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QUALITY MANAGEMENT SYSTEM IS DEAD. LONG LIVE QUALITY MANAGEMENT!

**SUSTAV UPRAVLJANJA KVALITETOM JE MRTAV.
ŽIVJELO UPRAVLJANJE KVALTETOM!**

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ABSTRACT

The terms quality management and quality management system are established in the international ISO 9000 standards. Quality management is an organizational management issue. However, for many years the primary interest has been in quality assurance, which is only the part of quality management that is related to requirements for achieving confidence among external customers. When a systematic approach was recognized for quality management realization, especially the quality professionals started to speak about quality systems as specialized systems for quality issues in an organization. However, this severed the natural link between quality management and the organization's business management. To remedy this launched the concept of the quality management system, this, however, did not solve the problem and also caused additional difficulties. Now there is a trend that quality management should be integrated as an organically seamless part of an organization's business system, and hence, a particular quality management system is no more needed. However, quality management remains the professional key concept for implementing quality in all organizations. This article examines the topic from historical and conceptual perspectives. Additionally, two practical examples are analysed with regard to the implementation of quality management and quality assurance in

practice: a small startup providing laboratory testing services and the large-scale and complex production and delivery system of vaccines.

Key words: quality, management, system, quality management, quality management system, quality system, startup, vaccine quality.

1. INTRODUCTION - ENSURING AND ASSURING QUALITY THROUGH ACTION

From the early history of quality professionalism, it has been understood that quality - the extent to which an object meets the requirements - does not arise by itself or by chance. We need to do something to achieve quality and particular actions to good quality. In organizations, this means quality management. Quality management ensures that the right things are done. Here, the effectiveness of quality management alone is not enough, but it also requires efficiency, which is achieved by an appropriate coherent, determined, and systematic approach.

Today's term quality management (QM) is defined in the ISO 9000 standard.¹ However, general interest has long been primarily in quality assurance (QA), i.e. requirements for building confidence between the organization and its customers. Actually, QA is a part of QM. Hence, internally within the organization, a more holistic approach is a necessity, where business-originated QM is seen as the profound foundation for QA, too, and also, a systematic approach is recognized for QM realization. Quality professionals started to introduce separate quality systems (QS) in organizations as their professional responsibility area and this led to quality management breaking away from business management. When this was found to be detrimental to quality itself, quality management systems (QMS) emerged as a backlash to ensure business integration. Now recently also QMSs are being integrated as an organically seamless part of an organization's business system, and a particular QMS is no anymore needed, as it is the situation in the latest ISO 9004 standard.

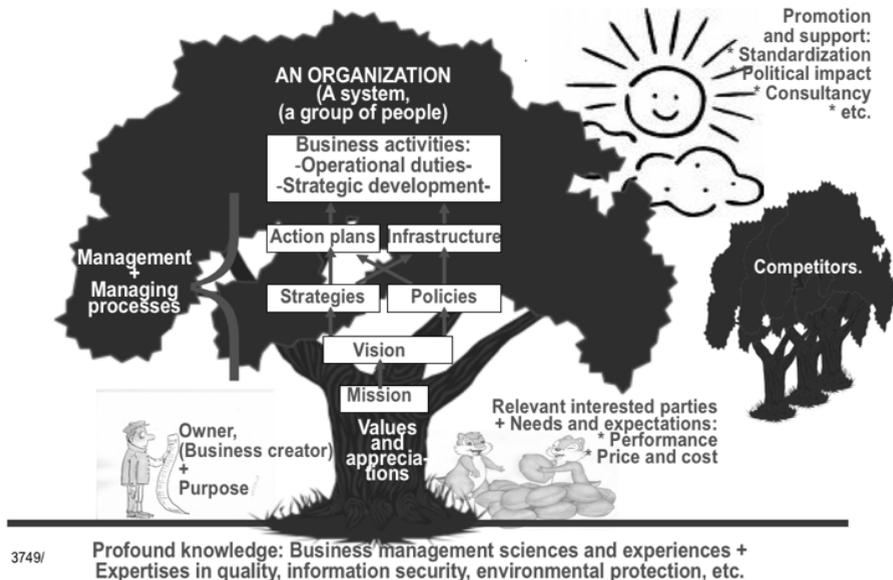
QM applies to an organization:² A group of people that has their own functions with responsibilities, authorities, and relationships to achieve its

¹ ISO, *ISO 9000, Quality management systems - Fundamentals and vocabulary*, ISO, Geneva Switzerland, 2015.

² Ibid.

objectives. In a special case, the organization can be a single person. An organization is a managed system that includes an internal and external context³ (Figure 1). Management implies coordinated activities to direct and control an organization. QM is part of management and its purpose is to *ensure* that all needs and expectations of the organization's business, actually the requirements of its interested parties⁴, are achieved. QA is part of quality management and is intended to *assure* the confidence and satisfaction of the customer or any other stakeholder in the organization with the organization's operations and products. QA is based on customers' requirements (i.e. needs and expectations), which also can be criteria for external certifications.

Figure 1. Internal and external context of an organization



In this context, it is essential to understand what is meant by the concept of a system. A system is a managed set of interrelated or interacting elements⁵. A system (Figure 2):

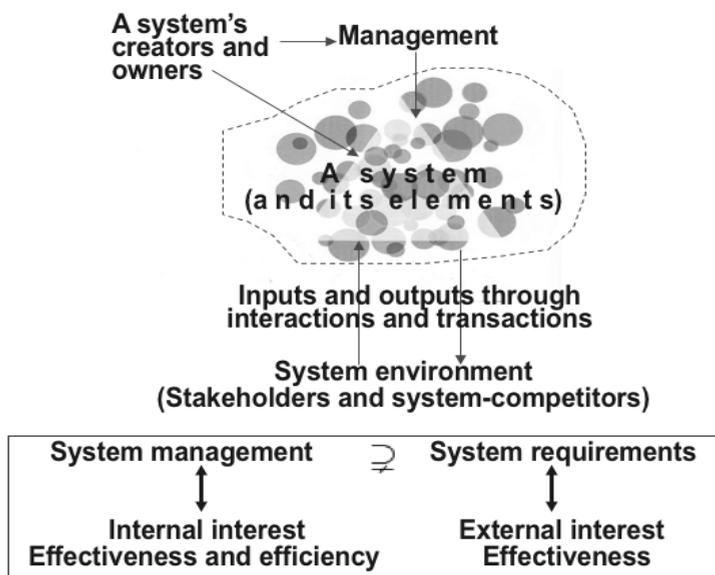
³ ISO, *ISO 9004 Quality management - Quality of an organization - Guidance to achieve sustained success*, ISO, Geneva Switzerland, 2018.

⁴ ISO, *ISO 9000, Quality management systems - Fundamentals and vocabulary*, ISO, Geneva Switzerland, 2015.

⁵ Ibid.

- Is an entity that maintains its existence and functions as a whole through the interaction of its parts.
- Has a purpose defined by the system's creators or owners'. The system is created to accomplish its aim.
- Has interactions and transactions with its environment to get input from and to provide output for system's stakeholders. Stakeholders may set requirements to the system.
- Is managed as a whole. External system requirements only apply to part of system management.

Figure 2. A managed system and its interaction with the environments.



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System management is more than system requirements: Russell's paradox: "Whatever involves all of a collection of objects must not be one of the collection." or Aristotle in the Metaphysics: "The whole is more than the sum of its parts."

The term management system (MS) is also sometimes used in the context of QM. It is also a rather questionable concept, as it is a question of the actions of the managers in particular and not of any system of management (Figures 1 and 2); leadership is not done by a system but by individuals.

Therefore, it is more appropriate to talk about management processes instead of a management system.

2. HISTORICAL OVERVIEW – THE INFLUENCE OF STANDARDS

Standards have had a significant impact on the formation and development of the concept of the QMS.

Military standards have influenced also the general development of QM. Early American Defense Forces quality specifications and standards used the terms inspection system and quality program,⁶ which were directly linked to the work operations and manufacturing processes. Also, the concept of quality system was also started use in these documents, especially after the publication of ISO 9000 standards.⁷ The first NATO standard⁸ used the term Quality Control System. Subsequent standards^{9,10} clarify that this is a matter of quality assurance requirements for military suppliers. The text of the standard states that the supplier must have a QMS that includes the requirements of the ISO 9001 standard.

The Canadian Z299 standards¹¹ were advanced and also served as a model for future ISO 9000 standards. These standards focused on the presentation of a wide range of requirements for suppliers of various products in the form of a quality assurance program consisting of separate quality assurance activities in the supplier's business system. The concept of QMS is not yet specifically used. Later, the Canadian standards Z299 were replaced by ISO 9000 standards.

The British BS 5750 standard¹² had a significant impact on the emergence and spread of ISO 9000 standards. It launched the standardized concept

⁶ DoD MIL-Q-9858A Specification, 1996. <https://www.quality-control-plan.com/examples/manufacturing/mil-q-9858a-specification/>

⁷ DoD, MIL-STD-109C, 1994). <http://www.woodencrates.org/standards/MIL-STD-109.pdf>.

⁸ NATO, AQAP-1, *Requirements for an Industrial Quality Control System*, 1984.

⁹ NATO, AQAP-2110, *Quality assurance requirements for design, development, and production*, 2003.

¹⁰ NATO, AQAP-2010, *Quality assurance requirements for design, development, and production*, 2016.

¹¹ SCC, CAN3-Z299 is a series of quality assurance standards developed by the Canadian Standards Association, 1975.

¹² BSI, *BS 5750 Quality systems - Specification for design/development, production, installation and servicing*, 1987.

<https://shop.bsigroup.com/products/quality-systems-specification-for-design-development-production-installation-and-servicing>.

of quality system (QS). Later (1994), the BS 5750 was replaced by ISO 9000 standards.

When the first versions of the ISO 9000 standards were born in the 1980s, the QS played an important role in them. The first version of the ISO 9000 vocabulary standard¹³ defined the QS as follows: The organizational structure, responsibilities, procedures, processes, and resources for implementing QM. The standard defined the concept of QM as that aspect of the overall management function that determines and implements the quality policy, and also its components, quality control, quality assurance, and quality improvement.

When the certification business grew stronger the concepts of the QS and QM began to be distorted when it was comprised that the QS would be some sort of separate system in the organization specifically for quality issues. In the worst case, it was only understood as a documented description of the QS, a quality manual. For this reason, and to remedy this, instead of the QS, the concept of a QMS was started using in the later ISO 9000 vocabulary standards¹⁴ to be in line with the concept of QM.

The recent ISO 9004 standard¹⁵ does not use the concept QMS anymore at all because its focus is on the quality of an organization and through that sustained success in complex, demanding, and ever-changing business environments. In the standard, the concept of QM can be understood as the quality of management, including both the personal performance of managers, the applicable management methodology, and organizational solutions. The concept of QM is based on its definition:¹⁶ Management with regard to quality and seven quality management principles:¹⁷

- Customer focus;
- Leadership;
- Engagement of people;
- Process approach;
- Improvement;
- Evidence-based decision making;
- Relationship management;

¹³ ISO, ISO 8402 *Quality - Vocabulary*, ISO, Geneva Switzerland, 1986.

¹⁴ ISO, ISO 9000, *Quality management systems - Fundamentals and vocabulary*, ISO, Geneva Switzerland, 2015.

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¹⁶ ISO, ISO 9000, *Quality management systems - Fundamentals and vocabulary*, ISO, Geneva Switzerland, 2015.

¹⁷ Ibid.

In line with the aforementioned defense industry, some sectors of society have developed their own well-established QM and particularly QA solutions. However, they are increasingly moving to ISO 9000 standards. Examples include the automotive industry, education, healthcare, and pharmaceutical and food industries. The automotive industry applies the ISO 9001 standard and complements it with its own additional requirements. References to the ISO 9001 standard have also been seen in the areas of education and healthcare. The pharmaceutical and food industries continue to follow their GMP (Good Manufacturing Practice)¹⁸ and GLP (Good Laboratory Practice) procedures¹⁹, which have also begun to have references to the ISO 9001 standard.

Regional and national quality award criteria^{20,21} describe performance excellence models and also they have developed into de facto standards for business-integrated QM, and they often are used parallel with the general international QM standards.

3. QUALITY MANAGEMENT SYSTEMATICITY

When the problems related to the quality system (QS) were tried to rectify with the new concept of the quality management system (QMS), new difficulties arose, and many organizations still understood that QMS is the same as QS, although it factually is a significantly different concept. The misunderstandings are due in particular to the fact that QMS is a concept with three nouns Q, M, and S without any connecting words. However, in different interpretations, QMS is not a separate system in an organization. This can be justified by the following analysis:

- a) QM-S: QM is according to its definition the management of an organization where Q is taken into account. Thus, Q takes place seamlessly in the context of the strategic and operational management of an organization. S in this context means that QM is implemented in a systematic way, i.e. according to the organization's own managing systematicity.

¹⁸ EC European Commission. EudraLex - Volume 4 - Good Manufacturing Practice (GMP) guidelines, 2022. https://ec.europa.eu/health/medicinal-products/eudralex/eudralex-volume-4_en.

¹⁹ EC European Commission, Good Laboratory Practice, 2021. https://ec.europa.eu/growth/sectors/chemicals/good-laboratory-practice_en.

²⁰ EFQM, *The EFQM Model*, 2013. <https://www.efqm.org/efqm-model/>.

²¹ NIST (National Institute for Standards and Technology). Malcolm Baldrige Criteria for Performance Excellence. NIST, Washington, 2010.

b) Q-MS: In practice, this also leads to the same result as the case a). The MS is an organization's management system, i.e. the organization's own systematic way to manage the business. When Q is appended to MS, it should be understood as an attribute in the same way as in expressions a quality car or a quality guy. Here, therefore, Q approaches the meanings of good or excellent.

Related to this context, J. Juran mentions as separate issues the quality of systems, the quality of processes, and the quality of management.²²

In order to avoid the problem with the concept of MS, the clearer expression in practical terms could be the management process. In some business sectors (e.g. telecommunications), the term managed system has been used in a similar situation.

This reflection is not new to us, but already in the 1990s²³, we launched the concept of quality integration, which was also put into practice in our company, and also considered it as an innovative application of ISO 9000 standards. Today especially the latest ISO 9004 represent this approach.²⁴

Also, quality control (QC) is also sometimes understood as QM, although that does not comply with ISO 9000 standardization. This may be related to the fact that as early as the 1950s, Feigenbaum²⁵ introduced the concept of Total Quality Control (TQC). In Japan practically the same concept got the name CWQC (Company Wide Quality Control) mainly by Dr. Ishikawa.²⁶ TQC was later changed - mainly as a result of quality award programs - to Total Quality Management (TQM), first in the US and later (even "officially") in Japan. However, the Japanese used the term TQC for a long time because their term QC had long been used mainly to describe today's QM.

TQM and TQC were never established as a standardized concept, although in the early ISO 9000 vocabulary standard²⁷ it was tried to get defined as follows: "Total quality management approach of an organization, centered on quality, based on the participation of all its members and aiming at long-

²² Joseph M. Juran, *A history of managing for quality: the evolution, trends, and future direction of managing for quality*, ASQC Quality Press, Milwaukee WI USA, 1995.

²³ Juhani Anttila, "Getting ISO 9000 happened more efficiently without a quality system and third party certificates", ICPQR'99 Conference, Vaasa, Finland, 1999.

²⁴ Juhani Anttila, Kari Jussila, "ISO 9004 - A stimulating quality management standard for the creative leaders of contemporary sustainable organizations", 2021. <https://sciendo.com/article/10.30657/pea.2021.27.19?fbclid=IwAR1e1SFozk5OKqJUqpUQQpYlRwjKIS3kdixpotaFWGiBu21nkKnjfmUGM8I>.

²⁵ Armand V. Feigenbaum, *Quality Control*, McGraw Hill, New York USA, 1951.

²⁶ ASQ, Kaoru Ishikawa, 2021. http://rube.asq.org/about-asq/who-we-are/bio_ishikawa.html.

²⁷ ISO, *ISO 8402 Quality - Vocabulary*, ISO, Geneva Switzerland, 1994.

term success through customer satisfaction, and benefits to all members of the organization and to society”. This definition was then deleted, and the next vocabulary standard²⁸ contained only a note: “Total quality management (TQM) is one form of quality management, which is based on the participation of all members of an organization”. When we analyzed TQM we recognized already early²⁹ that it is equivalent to ISO 9000’s QM, so in practice, the concept would no longer be needed. In reality, its use has much decreased.³⁰

In some cases (e.g. education sector), the term quality assurance system (QAS) is also seen,³¹ but there is no clear justification for it. Quality assurance (QA) is based directly on the organization’s certain QM activities, which are selected on a case-by-case basis and communicated to particular stakeholders to strengthen their confidence in the organization. In this case, the general standardized quality assurance model of ISO 9001 can also be used, which neither defines any specific system.

Especially for small organizations and startups, a quality plan³² is a better solution than QMS to implement QM or QA. From a practical point of view, in small organizations, QMS cannot actually and naturally be a separate or special system, or such would be downright detrimental to the effective and efficient implementation of QM. In these cases, quality integration and quality plans are the best way for QM and QA.

QM should be understood in a multidisciplinary manner, encompassing all the factual important and useful disciplines of management, which also have been described in many specific management system standards (MSS)³³ and other reference materials, including:

- The general basic QM standards, ISO 9000, ISO 9001, and ISO 9004.
- Supporting standards in the ISO 9000 and ISO 10000 series of standards.

²⁸ ISO, *ISO 9000 Quality management systems - Fundamentals and vocabulary*, ISO, Geneva Switzerland, 2000.

²⁹ Juhani Anttila, „Tractatus de summa qualitas et commentarii,“ IAQ Triennial meeting, Yokohama, Japan, 1996.

³⁰ Su Mi Dahlgaard-Park, “The quality movement: Where are you going?”, *Total Quality Management & Business Excellence*, Vol. 22, Issue 5, 2011.

³¹ Juhani Anttila, Maria João Rosa, Pedro Saraiva, ”Current societal challenges to quality and quality management in higher education”, IAQ, 2021.

<https://img1.wsimg.com/blobby/go/f9efea8c-f34b-41d8-a64d-aac8dd7f72ca/downloads/IAQ%20QiETT%20HE%20Quality%20Anttila%20Rosa%20Saraiva.pdf?ver=1640958029545>.

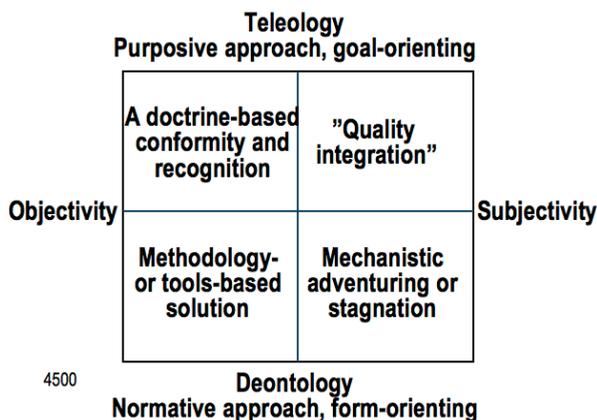
³² ISO, *ISO 10005 Quality management - Guidelines for quality plans*, ISO, Geneva Switzerland, 2018.

³³ ISO, Management system standards list, 2022. <https://www.iso.org/management-system-standards-list.html>

- Issue-specific QM and QA standards, e.g. for information security, OHS, etc.
- Sector-specific QM and QA standards, e.g. for automobile, aviation, pharmaceuticals, etc.
- General management science references, including QM related references.
- General guidelines for content structure and general concepts for the international QM standards.³⁴

Conceptually QM is quite clear. However, the vast majority of its implementations are based on the instrumental means of the different methodological schools, which is confusing and detrimental to understanding the concept itself. In order to obtain an overall understanding of the different practices, we have developed paradigm mapping (Figure 3)³⁵, which presents a scientific characterization of the different approaches. In all the different cases the same standard-based definitions of quality and QM apply.

Figure 3. Paradigmatic positioning of the different quality management approaches,



Source: Gibson Burrell, Gereth Morgan, "Sociological paradigms and organizational analysis. Elements of the sociology of corporate life", Athenaeum Press Ltd. Gateshead, UK, 1979.

³⁴ ISO/IEC Directives, Part 1, Consolidated ISO Supplement, Procedures specific to ISO, Annex SL, 2016. <http://docplayer.net/29750343-Iso-iec-directives-part-1-consolidated-iso-supplement-procedures-specific-to-iso.html>

³⁵ Juhani Anttila, Kari Jussila, "Understanding quality - conceptualization of the fundamental concepts of quality", (Updated and improved from the conference paper presented at QMOD 2016 Conference, Rome, Italy.), Int. J. Qual. Serv. Sci., (Vol. 9, No. 3e4), 2017.

Objective approaches use generally recognized and well-known models or practices, for instance, ISO 9000 standards, performance excellence models, maturity models, SixSigma methodology, lean methodology, etc. Deontological solutions aim at applying a method in the right way for conformity, for instance, establishing and maintaining a formal QMS according to the requirements of the ISO 9001 standard. Teleological solutions, for instance, aim at ISO 9001 certificate or quality award.

Subjective implementations of QM use organization-dedicated or tailored means. Deontological implementations often are only anecdotal approaches without any clear targets. We prefer teleological solutions that strive for organization-specific quality targets. This approach can also be considered as a natural solution to realize the formal definition of QM. We have experiences of this approach that we call Quality Integration.³⁶ In general, the quality integration aims at applying any useful methodologies and can be characterized by:

- Creative systematic, effective, and efficient integration with the business.
- Fulfilling the needs and expectations of all stakeholders of the organization.
- Continual improvement and refinement.
- Strategic and operational performance evaluation and analysis of facts.
- Information sharing, organizational learning, and innovation.

3.1. Example #1: Quality management and quality assurance in a startup

This example deals with startups, new business entities in a nascent stage. One of our practical cases is “The Startup”, for which we have considered business-integrated QM ideas and approaches.³⁷ The Startup in question is based on disruptive³⁸ innovation in the Faculty of Pharmacy at the

³⁶ Juhani Anttila, “Getting ISO 9000 happened more efficiently without a quality system and third party certificates”, ICPQR’99 Conference, Vaasa, Finland, 1999.

³⁷ Juhani Anttila, Kari Jussila, “Implementing quality management in startups”, QMOD Conference, Krakow Poland, 2019.

³⁸ Clayton M. Christensen, *The innovator’s dilemma*. Harvard Business School Press, USA, 1997.

University of Helsinki, and its purpose is to provide “killer app”³⁹ solubility analyzing services to big pharmaceutical companies. However, The Startup’s operations are not directly related to pharmaceutical production.

In the initial phase, the product of The Startup has been a specialized laboratory service but later the product could be a combination of hardware, software, and service with various possibilities will be challenged. Customers of The Startup consist of the major European and American pharmaceutical companies. The financiers are the important interested parties to the success of The Startup including the university, the government funding agency for innovations, and private venture capitalists.

During the development of The Startup, there has been a strong need for a variety of expertise, such as information content management, IPR, and information security management, which are also seen as a vital part of the QM of The Startup. Through this practical case, we have become convinced of business-integrated QM and the importance of consistent and continuous learning in creating and developing the business and quality of the startups.

Major QM and QA challenges of The Startup originate from the differences between The Startup and its customer organizations:

- The Startup is a small and newly emerged entrepreneurial venture and its customer organizations are very large, old, and traditional pharmaceutical companies.
- The Startup is focused on disruptive services for the manufacturers, which operate according to the established tradition of the pharmaceutical industry with formal regulation.
- Operations in The Startup are based on processes and in its customer companies on systems.
- The Startup has to operate very independently without significant partners or subcontractors, which is due, among other things, to secure the intellectual property associated with the invention and, on the other, for economic reasons. The big pharma companies are accustomed to many suppliers and their formal control.

These facts have a strong influence on the QM/QA realization in The Startup. The big pharma companies formally impose multidisciplinary general management system requirements on their suppliers, for instance related to

³⁹ Larry Downes, Chunka Mui, *Unleashing the Killer App*, Harvard Business School Press, Boston, USA, 2000.

EC European Commission. (2022). EudraLex - Volume 4 - Good Manufacturing Practice (GMP) guidelines, https://ec.europa.eu/health/medicinal-products/eudralex/eudralex-volume-4_en

product QA, information security and privacy, environmental protection and sustainability, occupational health and safety, human dignity, statutory and regulatory requirements, anti-bribery, and corruption. In addition to these, The Startup itself needs to take into account the business risks and continuity, and IPR management, from its business perspective.

For this kind of small startup, it is impossible to build many separate management systems, but it must focus effectively and efficiently on one business system. The natural professional approach to the challenging situation is that The Startup adopts the company-wide business-integrated approach to quality, QM, and QA with the following:

- Applicable concepts, terms, and their definitions are used according to the relevant international standards.
- QM is understood in a broad sense and based on the ISO/IEC Annex SL structure (ISO/IEC 2016), which is the general structural standard in all specific management standards, including the ISO 9001 standard. This should be supplemented, as necessary, with the relevant testing laboratory- and pharmaceutical sector-specific standard requirements. Additionally, the solution should be continually developed and tailored according to the principles of learning organizations.
- Key practices for QM include process management and PDCA (Plan-Do-Check-Act) approach.
- Requirements and roles of the new technologies and human skills are recognized and combined with agile and disruptive solutions.
- QA is based on quality management and tailored according to the requirements of the main customer companies. A standardized quality assurance plan⁴⁰ is a natural approach instead of specialized management systems.

A particular aspect related to the QA is that the big pharma companies have generally applied in their testing laboratories the very traditional OECD GLP standard,⁴¹ while a more appropriate and up-to-date standard would be ISO/IEC 17025.⁴² This ISO/IEC standard is also in line with the most commonly used and widely used quality assurance standard ISO 9001. This is

⁴⁰ ISO, *ISO 10005 Quality management - Guidelines for quality plans*, ISO, Geneva Switzerland, 2018.

⁴¹ OECD, *OECD principles of good laboratory practice*, 1997.

[http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=env/mc/chem\(98\)17&doclanguage=en](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=env/mc/chem(98)17&doclanguage=en)

⁴² ISO/IEC, *ISO/IEC, 17025:2017 General requirements for the competence of testing and calibration laboratories*, Geneva Switzerland, 2017.

not the case with the OECD GLP standard, although it often refers to the ISO 9001 standard. In the pharmaceutical sector, reference is often made to SOP (Standard operating procedures)⁴³ for documentation. In general, SOP is understood as detailed written instructions to achieve uniformity of the performance of a specific function. A problem here is that SOP practices are not standardized, but there are many different types of consulting-based implementation solutions. Here is also a conceptual problem. International standards understand that a procedure does not mean a document but an operational process. When describing this process with documents, the expression documented information is used.⁴⁴

Often startups are very focused on operational activities. However, both standards and prestigious startup literature (ISO 2018c) emphasize the importance of strategic business management and its inclusion in QM and its documentation as well.⁴⁵

3.2. Example #2: Quality management and quality assurance of Covid-19 vaccines (situation for Finland)

Another example deals with a large traditional pharmaceutical company and its extensive and complex global supply chain processes, ultimately ending up to a large number of individual citizens across the country. The subject of the study is a very topical case of widespread interest, the Covid-19 vaccine delivered to Finland and the related quality assurance and quality management procedures.

Our starting interest was the vaccine itself, the object of QM and QA, and what information is available on its material composition. Of course, this does not really mean the quality of the vaccine, that is, how the vaccine meets its actual needs and expectations. However, in this study, we want to focus specifically on issues in the area of production and delivery, rather than on issues of vaccine innovation and development processes. However, the ultimate quality of a vaccine is determined by its molecule biological structures.

Vaccines from three different manufacturers have been used in Finland, but in this context, we focused only on Pfizer-BioNTech and its COVID-19 Comirnaty vaccine, as it is the most widely used in the country. The prod-

⁴³ Andrea Henshall, *16 essential steps to writing Standard Operating Procedures*, 2017. <https://www.process.st/writing-standard-operating-procedures/>.

⁴⁴ ISO, ISO 9000, *Quality management systems - Fundamentals and vocabulary*, ISO, Geneva Switzerland, 2015.

⁴⁵ Eric Ries, "The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses", Random House, New York USA, 2011.

uct specification information,^{46,47} of the vaccine is generally available, but no analyzes of the vaccine's real structural composition have been officially performed in Finland or results are available. Instead, some studies on the material composition of the vaccine had unofficially been carried out by an independent Finnish research team and laboratory.⁴⁸ The samples were obtained from various vaccine stations around the country. The laboratory tests made were orientating and indicative because of the small sample lot, and no electron microscope, spectrum analyzer, or cell biology research means were available. However, even with a modest means, amazing and alarming signals were revealed that sparked interest in more information and research. The vials containing the same vaccine were not homogeneous. When the results were compared with the product specification, vaccines seem to contain a wide range of additives and impurities, which were not mentioned in the product specification. In addition, some vials contained only pure saline solution, although this was not indicated in any way on the vial label.

Very similar observations have been made in a number of other countries⁴⁹; Kyodo News 2021⁵⁰ Latypova 2021a⁵¹. There are no precise data on the causes of the impurities detected, and some of the vaccine additives are thought to have some purpose for which there is only speculation. The issue has been widely discussed in the international media⁵². Also, The European Medicines Agency (EMA) in their vaccine assessment report⁵³ refers to sim-

⁴⁶ BionTech, Summary Basis for Regulatory Action, 2021.

https://www.fda.gov/media/151733/download?utm_medium=email&utm_source=govdelivery.

BionTech, Summary of product characteristics, 2021.

https://biontech.de/sites/default/files/2020-12/Comirnaty_5735_Product_Information.pdf.

⁴⁷Pfizer, Pfizer-BioNTech COVID-19 Vaccine, Safety datasheet, 2021. <https://safetydatasheets.pfizer.com/DirectDocumentDownloader/Document?prd=PF00092~PDF~MTR~PFEM~EN>

⁴⁸ MKR Multidisciplinary MKR Research Team, the author as a member, Team internal discussion, 2021.

⁴⁹ Pablo Campra, Detection of graphene in Covid 19 vaccines, 2021. https://www.researchgate.net/publication/355979001_DETECTION_OF_GRAPHENE_IN_COVID19_VACCINES.

⁵⁰ Kyodo News. "Contaminants found in Pfizer vaccine in cities near Tokyo and Osaka", The Japan Times, 2021. <https://www.japantimes.co.jp/news/2021/09/15/national/contaminants-pfizer-tokyo-osaka/>.

⁵¹ A. Latypova, "Covid vax variability between lots – Independent research by international team", 2021a. <https://www.bitchute.com/video/4HllyBmOEJeY/>.

⁵² The Rio Times, International research groups find tiny sharp metal objects in Covid vaccines: 'Very frightening', 2021.

<https://www.riotimesonline.com/brazil-news/modern-day-censorship/international-research-groups-find-sharp-metal-objects-in-covid-vaccines-very-frightening/>.

⁵³ EMA, Assessment report, Corminaty, 2020.

<https://www.ema.europa.eu/en/medicines/human/EPAR/comirnaty>.

ilar findings, and the results of these tests have been extensively analyzed in Germany.⁵⁴ Based on the production process aspects, they also provide some explanations for the origin of the impurities.

Overall, it seems quite certain that there have been shortcomings in the quality of the vaccines supplied. In this situation, no explanation was received from the country's pharmaceutical authorities, although such an inquiry was made even at a very high political level, in the Parliament.⁵⁵ The responsible minister only made reference to QA procedures at the European level and to the quality systems of the laboratories that carry them out. The excipients in Corminaty have also been raised in the European Parliament.⁵⁶ As a result of all this, we set out to look more closely at QA measures for these vaccines at the European level.

In Finland, the Finnish Medicines Agency Fimea is the national responsible authority for regulating pharmaceuticals and operating under the Ministry of Social Affairs and Health. Fimea also has an ISO/IEC 17025 accredited laboratory for drug testing. Hence, we asked Fimea for the official information on the quality management and quality assurance procedures that have been applied to the vaccines delivered to Finland.

Corona vaccines for Finland are subject to acceptance tests required by good drug distribution practices. Acceptance inspection is the responsibility of the importing pharmaceutical wholesaler. The main requirements consist of (a) the European Commission's guidelines on good distribution practice for medicinal products for human use⁵⁷, and (b) the Fimea regulation on good distribution practice for medicinal products.⁵⁸ EC Guidelines and Fimea's guide imply regulations and guidelines for distributors of medicinal products regarding good distribution practices and batches of medicinal products. The appropriateness and quality of each incoming batch of medicine must be verified before it can be accepted for distribution. The certificate issued by the batch manufacturer shall be checked that the manufacturer has released the batch for distribution.

⁵⁴ GCEPIC, German Corona Extra-Parliamentary Inquiry Committee. Interview with Dr. Vanessa Schmidt-Kruger, 2021.

http://enformtk.u-aizu.ac.jp/howard/gcep_dr_vanessa_schmidt_krueger/.

⁵⁵ Ano Turtiainen, Kirjallinen kysymys (Written question) KK 509/2021 vp, In Finnish, (2021). https://www.eduskunta.fi/FI/vaski/KasittelytiedotValtiopaivaasia/Sivut/KK_509+2021.aspx

⁵⁶ European Parliament, Parliamentary questions, 2022.

https://www.europarl.europa.eu/doceo/document/P-9-2021-005690_EN.html?s=09.

⁵⁷ EC European Commission, *Good Distribution Practice of medicinal products for human use*, 2013. <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2013:343:0001:0014:EN:PDF>.

⁵⁸ Fimea. Lääkealan turvallisuus- ja kehittämiskeskuksen määräys, Lääkkeiden hyvät jakelutavat (Regulation of the Pharmaceutical Safety and Development Center, Good Distribution Practices for Medicines), (InFinnish). 2019.

Distributors (pharmaceutical wholesalers) do not carry out material checks on medicines. All authorized medicinal products distributed by pharmaceutical wholesalers have been exempted by the pharmaceutical company's QP (Qualified Person) to the EU/EEA market. Checks of the medicinal substance have been made at that stage or before. Even in the event that a manufacturing plant in Finland distributes its own pharmaceutical products, quality assurance samples have already been taken at the plant before the batch in question is released for distribution (QP exemption). During the manufacture of pharmaceuticals, the quality of raw materials and end products is constantly tested.

Vaccines are subject to OCABR⁵⁹ batch control, which means that each batch of vaccines is tested before being released for use by an independent testing laboratory in Europe. These laboratories are part of the Network of Independent Regulatory Laboratories for the Quality of Medicines (OMCL)⁶⁰ and have agreed on a formal exchange of information. The OMCL laboratories are official pharmacovigilance laboratories in Europe that perform quality testing of medicinal products as part of national regulatory tasks. OCABR testing is not performed in Finland, but batch control is based on the exchange of information within the network. OCABR activities are described in Annex III of the Administrative Procedure for Official Control Authority.⁶¹ The principle of the mutual acceptance of results is that controls can be carried out with reasonable resources. The OMCL network and OCABR testing are coordinated by the European Directorate for the Quality of Medicines & Health-Care (EDQM).⁶² Once the quality of the vaccine has been shown by official testing to meet pre-established criteria, the product is granted a quality batch release certificate (OCABR certificate). Each batch of vaccine imported into Finland must have a batch release certificate attesting to its quality before it is released for use.

⁵⁹ Council of Europe, General European OMCL Network (GEON), 2021.

<https://www.edqm.eu/en/general-european-omcl-network-geon>,

⁶⁰ Council of Europe, Human OCABR Guidelines, 2021b. <https://www.edqm.eu/en/human-ocabr-guidelines>.

⁶¹ EU, "EU Official Control Authority Batch Release, Human Vaccine and Blood Derived Medicinal Products," 2020. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKewjCpcyrxY70AhWtg_0HHSKYAD4QFnoECAwQAQ&url=https%3A%2F%2Fwww.edqm.eu%2Fsites%2Fdefault%2Ffiles%2Fmedias%2Ffichiers%2FOCABR%2FOCABR_June_2020%2F01_adproc_131219.doc&usg=AOvVaw2fmMiMm_iqEqIPA0YkSXSg

⁶² Council of Europe, The European Directorate for the Quality of Medicines & HealthCare (EDQM), 2021. <https://www.edqm.eu/>.

In conclusion, no material testing of vaccines is performed in Finland, and the manufacturer's Qualified Person is responsible for the batch-specific quality of the vaccines. This leads to the question is how to trust the manufacturer in question, in other words, what we know about the manufacturer's activities in general, how it has implemented its own QM, and how QA has been agreed with it.

Essential in this context is that the manufacturer in question, Pfizer, is known to have a large criminal record of continual past illegal activities with regard to the launch and marketing of medicines, for which they have also had to pay great compensation as a penalty.^{63,64,65}

In particular, in the development stage and the approval testing of these Comirnaty vaccines in the US, this manufacturer has been fraudulent in terms of QM and QA^{66,67}. In this situation, the purchasers of the vaccines and regulatory authorities should have taken enhanced QA measures in accordance with good professional practice and in particular performed appropriate risk management measures^{68,69}). We also examined the agreement between the EU and Pfizer on vaccines,⁷⁰ according to which virtually no responsibility has been set for the quality and delivery of its products to that manufacturer

⁶³ Suhas Gondi, Rishi K. Wadhwa, "Financial Penalties Imposed on Large Pharmaceutical Firms for Illegal Activities", 2020.

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjOxou05qL1AhVk-ioKHTthOAUMQFnoECAIQAQ&url=https%3A%2F%2Fjamanetwork.com%2Fjournals%2Fjama%2Farticlepdf%2F2772953%2Fjama_arnold_2020_ld_200099_1605024490.7254.pdf&usg=AOvVaw1_NKupTuQbVsPg97_2IuVE

⁶⁴ Brian Buntz, "GSK, Pfizer and J&J among the most fined drug companies, according to study", 2020. <https://www.pharmaceuticalprocessingworld.com/gsk-pfizer-and-jj-among-the-most-fined-drug-companies-according-to-study/>.

⁶⁵ State of the Nation, *Why Pfizer can never be trusted*, 2022. <https://stateofthenation.co/?p=104292>.

⁶⁶ CCCA, Canadian Covid Care Alliance Pfizer Inoculations Do More Harm Than Good, 2021. <https://www.canadiancovidcarealliance.org/wp-content/uploads/2021/12/The-COVID-19-Inoculations-More-Harm-Than-Good-REV-Dec-16-2021.pdf> (Text) and <https://rapsodia.fi/pfizerin-covid-19-rokotteista-enemman-haittaa-kuin-hyotya-2/> (Video).

⁶⁷ Paul D. Thacker, "Covid-19: Researcher blows the whistle on data integrity issues in Pfizer's vaccine trial", 2021. *BMJ* 2021;375: 2635. <https://www.bmj.com/content/375/bmj.n2635>.

⁶⁸ ISO, *ISO 31000 Risk management - principles and guidelines*, ISO, Geneva Switzerland, 2018.

⁶⁹ WHO, "World Health Organization Application of Hazard Analysis and Critical Control Point (HACCP) methodology to pharmaceuticals", 2003. https://www.who.int/medicines/areas/quality_safety/quality_assurance/ApplicationHACCPMethodologyPharmaceuticalsTRS908Annex7.pdf?ua=1.

⁷⁰ EC European Commission, SANTE/2020/C3/043 - SI2.838335, The-EC-contract-with-Pfizer, 2020. <https://static.mvlehti.net/uploads/2021/09/The-EC-contract-with-Pfizer.pdf>.

would have. One can get the same impression also from some other revealed Comirnaty agreements between Pfizer and the country of delivery.

Based on this example of ours, it can be seen that this large-scale global, and traditional pharmaceutical industry sector has drifted away from the naturally integrated QM and instead adopted formal, complex, and ineffective practices. For example, there is still talk of quality systems. This has been possible because also the regulatory authorities have contributed to making such happen. This industry sector is also very conservative, where the implementation of new innovative solutions of QM is slow and challenging, and hence, the sector has not been able to follow global megatrends, which requires more QM/QA research, more open exchange of information, and unbiased scientific debate.⁷¹ There would be a clear need for the development of more effective and efficient QM and QA methodologies for the sector, which would require a revitalization of the quality professionalism in the entire pharmaceutical and healthcare business ecosystem and would most naturally start with individual active and respected persons.⁷²

This example represents a particular business sector, where it has been influenced by many strong economic, authoritarian, and political interests, including corruption,⁷³ that are even in conflict with the relevant QM requirements^{74,75,76}. Adverse developments could have been influenced through effective risk management, which is now a major practice in all the latest QM standards. However, the issue is even broader and relates to contemporary jurisprudence, the operating culture of the business sector, and ethics.⁷⁷ Di-

⁷¹ IAPMS (International Alliance of Physicians and Medical Scientists), *The Rome Declaration*, 2021. <https://doctorsandscientistsdeclaration.org/original/>.

⁷² Ibid.

⁷³ Rogan R. Malone, Malone interview video, 2021.

https://rapsodia.fi/joe-rogan-robert-malone-3-tunnin-haastattelu-suomeksi-2/?fbclid=IwAR0jWWXBXcvQiHaS--M8LobgP2qf16LFPcfd9c1YNxojwcjj7R-Wvcz88_Y.

⁷⁴ EC, European Commission. EudraLex - Volume 4 - Good Manufacturing Practice (GMP) guidelines, 2022. https://ec.europa.eu/health/medicinal-products/eudralex/eudralex-volume-4_en

⁷⁵ FDA, Status of current good manufacturing practice regulations, 2021. <https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfCFR/CFRSearch.cfm?fr=210.1>.

⁷⁶ A. Latypova, Covid vax variability between lots – Independent research by international team, 2021. <https://www.bitchute.com/video/4HIIyBmOEJeY/>.

⁷⁷ Rogan R. Malone, Malone interview video, 2021.

rectly related to our subject, the bioethical aspects^{78,79} have been emphasized comprehensively, covering pharmaceutical companies, related regulatory organizations, political decision-makers, hospitals, research and education (medicines and health care), and medical personnel. A lot of practical standardized approaches and guidance are already available for this.^{80,81,82,83,84} Also, the IAQ Quality Manifesto⁸⁵ emphasizes the moral viewpoint, Goodness for Humanity, as the basis of modern quality professionalism.

4. CONCLUSION

Throughout the history of the quality profession, proper and effective operations have been valued as a key means of achieving quality. Regarding the human level, individuals, quality is realized as a natural endeavor in professional work and skill. In an organization, this should be done in a managed way. This is the starting point for quality management (QM), the managed quality within an organization and its business. In order to operate effectively, both a systematic and consistent approach is needed, especially when efficiency is a business requirement in addition to effectiveness.

Pioneers and early researchers of quality developed specific thinking and operational models and practices for quality especially in industrial environments, and through global collaboration and associations quality professionalism emerged. In addition to the implementation of the organizations'

⁷⁸ Rogan R. Malone, LifeSite – Malone interview video, 2021.

<https://rumble.com/vrxj8u-mrna-rokoteteknologian-kehittj-robert-malone-puhuu-koronan-hoitoon-liittyvi.html?fbclid=IwAR0p8z-nowfAimh2HqSVmvc-mAHCxDxyE5SoRY6ly4EeCcFKj7mvE3f71b0>.

⁷⁹ MSU Michigan State University, *What is Bioethics?*, 2021. <https://bioethics.msu.edu/what-is-bioethics>.

⁸⁰ ISO, *ISO 26000 Guidance on social responsibility*, ISO, Geneva Switzerland, 2021.

⁸¹ SOX, Sarbanes Oxley, 2022. <https://sarbanes-oxley-101.com/about.htm>.

⁸² ISO, *ISO 28000 Specification for security management systems for the supply chain*, ISO, Geneva Switzerland, 2007.

⁸³ CFA Institute, *The Standards of Practice Handbook*, 2014.

<https://www.cfainstitute.org/-/media/documents/code/code-ethics-standards/standards-practice-handbook-11th-ed-eff-July-2014-corr-sept-2014.pdf>.

⁸⁴ ISO, *ISO 37001 Anti-bribery management systems - Requirements with guidance for use*, ISO, Geneva Switzerland, 2016. <https://www.iso.org/standard/65034.html>.

⁸⁵ IAQ, Quality Manifesto for the 21st century, 2021.

<https://img1.wsimg.com/blobby/go/f9efea8c-f34b-41d8-a64d-aac8dd7f72ca/downloads/Revitalizing%20Quality%20-%20The%20Quality%20Manifesto%20f.pdf?ver=1638230598641>.

internal business strategic quality objectives, means were also needed to generate and strengthen confidence in the organization's quality capability among customers and also to other stakeholders, for instance in the context of contracts. This led to the practices of quality assurance (QA). Sectoral standardization, especially relating to the QA requirements, was launched by major societal actors, to be used, for instance, in the large procurement networks of the Defense Forces and automobile industry. Through international standardization, the standardization of the QM area was also started.

Extensive standardization, which has also been closely linked to the interests of business and economy, has strongly developed quality practices, even exceeding the pursuit and work of leading experts and researchers in the field. Through the ISO 9000 standards, the quality management procedures of different sectors have been also converging. A detrimental feature of this development was the separation of quality doctrines from actual activities. Thus were also born the concepts of QS and QMS, which began to live their own fictional lives.

As a counter-reaction, the need was raised for the revitalization of the entire quality discipline. The issue was also strongly influenced by major societal changes, megatrends, and complexity, for instance, due to digitalization. The key issue is that quality must now be seen as a multidisciplinary issue and that the measures that implement it must be integrated into real action taking into account the risks involved. Central to QA, in particular, is the ethical perspective and the approach to achieving it. In the article, we have dealt with two very different organizational cases where such viewpoints and approaches are necessary.

Sažetak:

SUSTAV UPRAVLJANJA KVALITETOM JE MRTAV. ŽIVJELO UPRAVLJANJE KVALITETOM!

Pojmovi upravljanje kvalitetom i sustav upravljanja kvalitetom utvrđeni su u međunarodnoj normi ISO 9000. Upravljanje kvalitetom je pitanje upravljanja organizacijom. No, već dugi niz godina primarni interes je osiguranje kvalitete, što je samo dio upravljanja kvalitetom koji se odnosi na zahtjeve za postizanjem povjerenja kod vanjskih kupaca. Kada je prepoznat sustavni pristup u ostvarivanju upravljanja kvalitetom, posebice stručnjaci za kvalitetu počeli su govoriti o sustavima kvalitete kao specijaliziranim sustavima za pitanja kvalitete u organizaciji. Međutim, time je prekinuta prirodna veza između upravljanja kvalitetom i poslovnog upravljanja organizacije. Kako bi se to popravilo pokrenut je koncept sustava upravljanja kvalitetom,

ali to nije riješilo problem, već je izazvalo dodatne poteškoće. Sada postoji trend da upravljanje kvalitetom treba biti integrirano kao organski neprekidni dio poslovnog sustava organizacije, pa stoga poseban sustav upravljanja kvalitetom više nije potreban. Međutim, upravljanje kvalitetom ostaje profesionalni ključni koncept za implementaciju kvalitete u svim organizacijama. Ovaj članak ispituje temu iz povijesne i konceptualne perspektive. Dodatno, analizirana su dva praktična primjera s obzirom na implementaciju upravljanja kvalitetom i osiguranja kvalitete u praksi: mali startup koji pruža usluge laboratorijskog testiranja te veliki i složeni sustav proizvodnje i isporuke cjepiva.

Ključne riječi: kvaliteta, upravljanje, sustav, upravljanje kvalitetom, sustav upravljanja kvalitetom, sustav kvalitete, pokretanje, kvaliteta cjepiva.

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EFQM MODEL – PREGLED RAZVOJA I KOMPARATIVNA ANALIZA POSLJEDNJIH TRIJU VERZIJA MODELA

**EFQM MODEL –DEVELOPMENT OVERVIEW AND
THE COMPARATIVE ANALYSIS OF THE LAST
THREE VERSIONS OF THE MODEL**

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SAŽETAK

EFQM model je model pomoću kojeg određena organizacija može unaprijediti svoje performanse i upravljati promjenama, te tako postići poslovnu izvrsnost. EFQM model po svojoj je prirodi dovoljno općenit da ga može implementirati široki spektar organizacija, kojima on donosi brojne koristi (kao što je mentalitet stalnog poboljšanja). EFQM model nastoji zadržati svoju prikladnost i relevantnost na različite načine (manje promjene, revizije itd.). U radu je obrađena struktura modela prema aktualnoj verziji, što je neizostavno za razumijevanje modela, kao i povijest koja je prethodila nastajanju aktualne verzije. Cilj rada je izraditi komparativnu analizu modela iz 2010., 2013. i 2019. godine te prikazati razvoj EFQM modela koji je vodio

do posljednjeg, trenutno aktualnog modela. Svrha rada je razumijevanje modela, kao i promjene kroz koje je prošao kako bi se mogao predvidjeti i razumjeti budući razvoj modela.

Ključne riječi: poslovna izvrsnost, EFQM model, upravljanje promjenama, održivi razvoj.

1. UVOD

Od svog začetka 1991. godine, EFQM (European Foundation for Quality Management – Europska fondacija za upravljanje kvalitetom) model je međunarodno priznat kao struktura koja pomaže organizacijama da upravljaju promjenama te poboljšavaju performanse organizacije. Po svojoj prirodi model je generičan/općenit, kako bi se osigurala primjenjivost u svim organizacijama neovisno o njihovoj veličini, djelokrugu ili poslovnom sektoru, te ga je do danas uvelo tisuće entiteta diljem svijeta.¹ Radi osiguranja pravovajnosti i adekvatnosti EFQM modela nerijetko se provode revizije i različite promjene na modelu. Takvo održavanje i unaprjeđenje modela proizlazi iz stečenog iskustva te iz akademskih istraživanja.

EFQM model, koji je organizacijama dostupan već gotovo 35 godina, od svog je začetka nudio organizacijama obrazac za stvaranje kulture inovacija i unaprjeđenja. Kroz svoje postojanje EFQM model, koji je služio organizacijama kao alat za ocjenjivanje, postao je ključan okvir i metodologija kojima se upravlja promjenama, transformacijama i nesukladnostima s kojima se organizacije svakodnevno suočavaju.² U 2019. godini objavljena je nova verzija EFQM modela „EFQM 2020“, za koji je već sljedeće godine (2021.) objavljena njegova revizija.³ EFQM 2020 model je u skladu s europskim vrijednostima i poslovnom etikom te uključuje ciljeve održivog razvoja Ujedinjenih Naroda (eng. *Sustainable Development Goals* - SDG). No, zbog svoje recentnosti literatura koja govori o EFQM 2020 modelu je oskudna.⁴ Kako bi se stvorio novim EFQM model anketirano je gotovo 2000 stručnjaka za pro-

¹ Sebastian – Ivan Godina, *EFQM model – komparativna analiza stare i nove verzije modela*, diplomski rad, Sveučilište Sjever, Koprivnica, 2021.

² Laura A. Schmidt et. al., EFQM Core Team, *The EFQM model Revised 2nd edition*, Brussels, Belgium, 2021.

³ Luis Fonseca, António Amaral, J. M. Oliveira, „Quality 4.0: The EFQM 2020 Model and Industry 4.0 Relationship and Implications“, Sustainability, MDPI, 2021.

⁴ Sebastian – Ivan Godina, *EFQM model – komparativna analiza stare i nove verzije modela*, diplomski rad, Sveučilište Sjever, Koprivnica, 2021.

mjene, omogućene su 24 interne radionice, komuniciralo se sa vodstvima iz 60 različitih organizacija, te je formiran tim stručnjaka i suradnika iz različitih industrija i akademske zajednice. Pomoću takve jedinstvene vrste suradnje uspio se stvoriti, pilotirati i usavršiti fleksibilan okvir koji će ostvariti svoju svrhu i pomoći organizacijama da, kratkoročno i dugoročno, promijene svoj način rada. Jednostavno rečeno EFQM model pomaže određenoj organizaciji da ostvari uspjeh, tako da identificira gdje se organizacija trenutno nalazi po pitanju stvaranja održive vrijednosti. Također pomaže da organizacija identificira svoje nedostatke, ali i moguća rješenja, s ciljem značajnog unapređenja performansi organizacije.⁵

Cilj ovog rada je napraviti pregled povijesti razvoja EFQM modela s naglaskom na komparaciji triju posljednjih verzija modela, a to su modeli iz 2010., 2013. i 2019. godine. Svrha rada je bolje razumijevanja trenutnog oblika modela, kao i utvrđivanje potencijalnog budućeg razvoja modela. U ovom radu vršeno je sekundarno istraživanje, a rad je podijeljen u četiri temeljna dijela. U prvom dijelu dan je uvod te pregled trenutne strukture, kao i razvoja EFQM modela. Drugi dio obuhvaća komparaciju modela iz 2010. godine i 2013. godine, dok treći dio obuhvaća komparaciju modela iz 2013. i 2019. godine. U posljednjem, četvrtom dijelu rada, definirani su zaključci izvedeni iz provedene komparativne analize triju modela.

2. TRENUTNA STRUKTURA EFQM MODELA

Zbog kombinacije strateške naravi EFQM modela i njegove usmjerenosti na operativne performanse te usmjerenosti na rezultate, EFQM model je savršen mehanizam za ispitivanje koherentnosti i usklađenosti budućih ambicija neke organizacije u odnosu na trenutni način rada organizacije te njezinog trenutnog načina reagiranja na izazove.⁶ Korištenje EFQM modela omogućuje sagledavanje cjelokupnog sustava, tj. zauzimanje holističkog pristupa i uvažavanje kompleksnosti i uređenosti sustava pojedine organizacije. Na organizaciju treba gledati kao na kompleksan, prilagodljiv sustav, koji je građen od brojnih zasebnih ljudskih bića u jednom dinamičkom okruženju.⁷ Iz svega navedenog, struktura EFQM modela se temelji na jednostavnoj, ali snažnoj logici postavljanja tri pitanja:

⁵ Ibidem.

⁶ Ibidem.

⁷ Ibidem.

- ZAŠTO: Zašto organizacija postoji? Koju svrhu ispunjava? Zašto ima takvu strategiju? → SMJER
- KAKO: Kako organizacija namjerava ispuniti svoju svrhu i strategiju? → IZVEDBA
- ŠTO: Što je organizacija postigla do danas? Što namjerava postići u budućnosti? → REZULTATI⁸

Slika 1. Struktura EFQM modela



Izvor: Sebastian-Ivan Godina, *EFQM model – komparativna analiza stare i nove verzije modela*, diplomski rad, Sveučilište Sjever, Koprivnica, 2021.

U srži racionalizacije EFQM modela, odnosno glavna nit vodilja, je međuovisnost svrhe i strategije organizacije te kako se one koriste u stvaranju održive/trajne vrijednosti i za postizanje rezultata za svoje najznačajnije zainteresirane strane.⁹

⁸ <https://www.efqm.org/efqm-model/> (17.01.2022.)

⁹ Sebastian – Ivan Godina, *EFQM model – komparativna analiza stare i nove verzije modela*, diplomski rad, Sveučilište Sjever, Koprivnica, 2021.

Na Slici 1 prikazana je trenutna struktura EFQM modela. Stvaranju takve strukture prethodile su prvobitna verzija, revizije i stvaranja novih verzija, skupljanje iskustva i povratnih informacija, različite nadopune, dorade te unapređenja prijašnjih verzija. U sljedećem poglavlju su prikazani najvažniji dijelovi tog razvoja.

3. PREGLED RAZVOJA EFQM MODELA

Europska nagrada za kvalitetu (European Quality Award – EQA) nastala je 1991. godine kao europski ekvivalent američkoj nagradi M. Baldrige. Uzela je američku nagradu kao svoju početnu točku te ju je usavršila na način da ima sličnu, ali jednostavnu usmjerenost na usvajanje potpune kvalitete kao alata za unaprjeđenje poslovanja.¹⁰ EFQM model je intelektualno vlasništvo Europske zaklade za upravljanje kvalitetom, koja je neprofitna zaklada sa sjedištem u Bruxellesu.¹¹

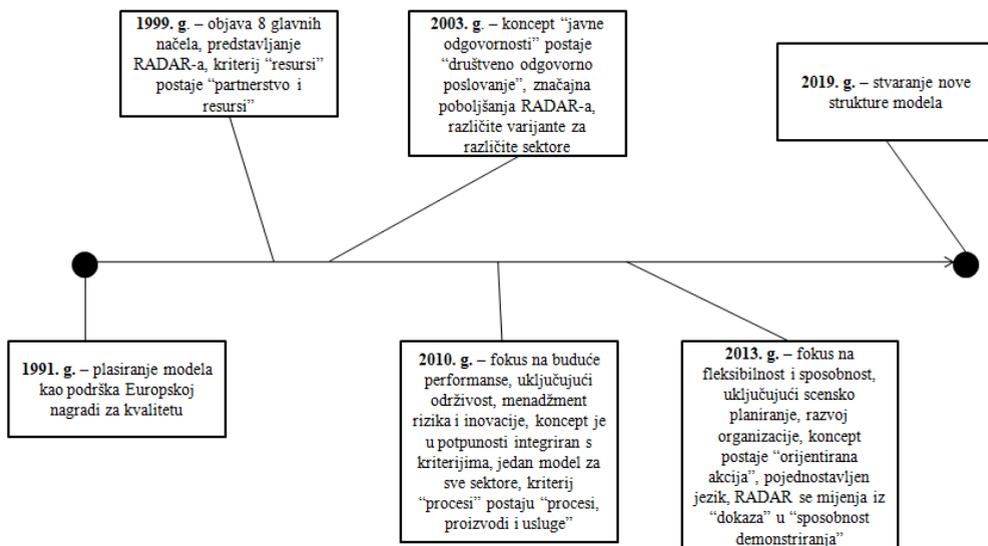
EFQM model, globalno priznat okvir koji pruža podršku organizacijama kod upravljanja promjenom i kod unapređenja njihovog poslovanja, je tijekom vremena doživio nekoliko ciklusa unaprjeđenja, ne samo kako bi ostao relevantan, nego i da nastavlja određivati menadžersku agendu za organizacije koje žele dugoročno održivu budućnost.¹²

¹⁰ Roberta Pavlović, *EFQM model izvrsnosti*, diplomski rad, Sveučilište Jurja Dobrile u Puli, Pula, 2016.

¹¹ <https://www.nefconsulting.com/training-capacity-building/resources-and-tools/efqm-model/> (17.01.2022.)

¹² Laura A. Schmidt et. al., EFQM Core Team, *The EFQM model*, EFQM, Brussels, Belgium, 2019.

Slika 2. Vremenska crta razvoja EFQM modela



Izvor: Sebastian – Ivan Godina, *EFQM model – komparativna analiza stare i nove verzije modela*, diplomski rad, Sveučilište Sjever, Koprivnica, 2021.

Iz slike 2. mogu se vidjeti promjene koje su se odvijale tijekom 30 godina postojanja EFQM modela. Najviše promjena dogodilo se u privatnom i neprofitnom sektoru. Tijekom vremena, mnogi alati, tehnike pa čak i jezik koji su bili predviđeni samo za privatni sektor, postali su zajednički i za javni sektor. Najveći pomak vidi se u 2003. godini kad se daje veliki značaj kriteriju društveno odgovornog poslovanja te se rade značajna poboljšanja u RADAR matrici. U 2010. godini stavlja se fokus na održivi razvoj i inovacije te se time želi biti u korak s promjenama koje se događaju u tehnologiji. Gledajući prema budućnosti, zajednica za izvrsnost ima alata, kapaciteta i prilike da napravi još veće promjene u sljedećih 25 godina.¹³

U nastavku su nabrojana značajnija unaprjeđenja koja su napravljena prije 2010. godine:

- 8 temeljnih načela izvrsnosti – definiraju koncept održive izvrsnosti u okviru višeg menadžmenta,

¹³ Roberta Pavlović, *EFQM model izvrsnosti*, diplomski rad, Sveučilište Jurja Dobrile u Puli, Pula, 2016.

- RADAR koncept – omogućuje mjerenje razine izvrsnosti neke organizacije, kako za omogućitelje tako i za rezultate, što omogućuje uspoređivanje i benchmarking,
- stvara se veza između omogućitelja i rezultata uvođenjem poveznice „učenje i inovacija“.¹⁴

2009. godine menadžment EFQM-a odlučio je temeljito pregledati EFQM model na temelju dobivenih povratnih informacija svih zainteresiranih strana koje koriste model, a to su: članovi, partneri, ocjenitelji, treneri i konzultanti.¹⁵ Prikupljena iskustva i informacije bile su od velikog značaja za stvaranje nove verzije (2010. godine).

U modelu iz 2010. se po prvi puta definira izvrsnost već na naslovnoj strani: „Izvrzne organizacije postižu i održavaju superiornu razinu performansi koje ispunjavaju ili nadmašuju očekivanja svih zainteresiranih strana“. Tako se stvara jasan fokus na očekivanja koja imaju različite zainteresirane strane.¹⁶

Naravno, razvoj EFQM modela ne staje 2010. godine, zapravo već nakon samo dvije godine (2012.) izlazi nova verzija modela „EFQM 2013“. Budući da su verzije 2010., 2013. i 2019. posljednje tri verzije modela u nastavku rada napravljena je usporedba istih.

4. KOMPARATIVNA ANALIZA VERZIJA IZ 2010. I 2013.

EFQM model iz 2013. godine očekuje od organizacija da obraćaju pažnju na promjene koje se javljaju unutar i izvan poslovnog okruženja te da na njih reagiraju i njima se prilagođavaju na brz način. Stoga, kao jedna od temeljnih razlika u verzijama 2010. i 2013. godine jest uvođenje agilnosti u poslovanje. Također, veći naglasak se stavlja na razvoj pristupa, točnije sadržaj kriterija „omogućitelj“ od organizacija očekuje da razvijaju prikladne pristupe kojima će postići željene rezultate. U sklopu modela iz 2013. godine se od organizacija očekuje da unaprjeđuju korporativno upravljanje i upravljanje rizicima te da se osigura sklad sa pravnim i regulatornim zahtjevima. Dakle, veći naglasak je na odgovornosti vodstva, upravljanje općenito te upravljanje rizicima.

U modelu iz 2013. godine veći fokus je stavljen na relevantna mjerenja, preciznije mjerenja ne smiju sama sebi biti svrsi. Mjerenja moraju biti

¹⁴ Christian Forstner et. al., *25 years of the EFQM excellence model*, EFQM, Brussels, 2016.

¹⁵ Ibidem.

¹⁶ Ibidem.

razborita mješavina kvantitativnih i kvalitativnih, te se trebaju fokusirati na očekivanja zainteresiranih strana. Također, u novijem modelu kriteriji su eksplicitniji te više propisujući. Neka od implicitnih očekivanja su eksplicitno iznesena i podkriteriji su više propisujući nego prije (npr. podkriterij 3b – osigurajte se da njihovi ljudi imaju nužne kompetencije, resurse i mogućnosti da maksimaliziraju svoj doprinos).

Verzija modela iz 2013. godine traži od vodstva da razumiju buduće scenarije, identificiraju buduće prilike, prijetnje i da efektivno upravljaju promjenom te da osiguraju budućnost svojoj organizaciji. Temeljem navedenog, performanse iz prošlosti ne smatraju se garancijom za budući uspjeh. Veći fokus treba biti na cjelokupnom lancu vrijednosti. Koncept partnerstva se, u verziji 2013., mora protezati nad cijelim lancem vrijednosti. Od organizacije se očekuje da izgradi kapacitete koji nadilaze njezine okvire. Također, od organizacija se očekuje da preuzmu odgovornost za poticanje svojih zainteresiranih strana na sudjelovanje u aktivnostima koje doprinose društvu, odnosno naglasak se stavlja na društvenu odgovornost organizacije. Uz to, organizacije moraju integrirati načela održivosti u svoju strategiju, lanac vrijednosti i procese te osigurati za to potrebne resurse (podkriterij 2c). Nadalje, model nalaže organizacijama da upravljaju zgradama, opremom i materijalima na financijski i ekološki održiv način (podkriterij 4c).

Iako je inovacija dio EFQM modela već duže vrijeme, u verziji 2013. se na nju stavlja još veći naglasak. Tako se zahtjevi za inovacijom pojavljuju u svih 5 omogućitelja (kao npr. podkriterijima 1d, 2d, 3c, 3e, 4d, 4e i 5a). Od organizacije se očekuje da ima strukturiran pristup inovaciji, odnosno da inovaciju učini sastavnim dijelom strategije te da postavi jasne ciljeve inovacije.¹⁷

U Tablici 1 i Tablici 2 prikazane su neke od razlika između verzija modela 2010. i 2013., a koje se odnose na temeljna načela izvrsnosti i na RADAR.

¹⁷ <https://www.qualityindeed.com/download/publications/25.pdf> (17.01.2022.)

Tablica 1. Razlike između verzija modela 2010. i 2013. – temeljna načela izvrsnosti

2010.	2013.	Razlog izmjene
Upravljanje pomoću procesa	Upravljanje agilnošću	Organizacije moraju demonstrirati visoku razinu fleksibilnosti i agilnosti kod upravljanja poslovnim procesima, kako bi reagirali na prilike i prijetnje.
Uspjeh kroz ljude	Uspjeh kroz talente ljudi	To će pomoći organizacijama da jasno definiraju, izgrade i unaprijede kompetencije svojih ljudi.
Stvaranje partnerstva	Razvoj organizacijske sposobnosti	Stvaranje partnerstva nije dovoljno, organizacije moraju razvijati svoje kapacitete na svim razinama lanca vrijednosti.

Izvor: Izradio autor prema <https://www.qualityindeed.com/download/publications/25.pdf> (pristupljeno: 17.01.2022.)

U Tablici 1. jasno i pregledno su istaknute neke od razlika povezane sa temeljnim načelima izvrsnosti te su dana objašnjenja zbog čega je došlo do navedenih promjena. No, postoji još jedna promjena koju valja istaknuti, a to je da su 8 temeljnih načela izvrsnosti u verziji iz 2013. poredani abecednim redom kako ne bi došlo do nesporazuma po pitanju njihove važnosti.¹⁸

Tablica 2. Razlike između verzija modela 2010. i 2013. – RADAR

2010.	2013.
Dokaz	Sposobnost demonstriranja
Ocjenitelji moraju dokazati da organizacija nije „globalni uzor“.	Organizacija mora dokazati da je „globalni uzor“.
Ključni rezultati	Poslovni rezultati

Izvor: Izradio autor prema <https://www.qualityindeed.com/download/publications/25.pdf> (17.01.2022.)

¹⁸ Ibidem.

Iako Tablica 2. jasno prikazuje razlike koje su nastale između navedene dvije verzije ipak je potrebno objasniti posljednje navedenu razliku. Ključni rezultati su uzrokovali zbunjenosti, budući da se riječ „ključni“ isto tako koristila za identificiranje najvažnijeg rezultata (npr. ključni rezultati kupaca, *ključni ključni rezultati*).¹⁹

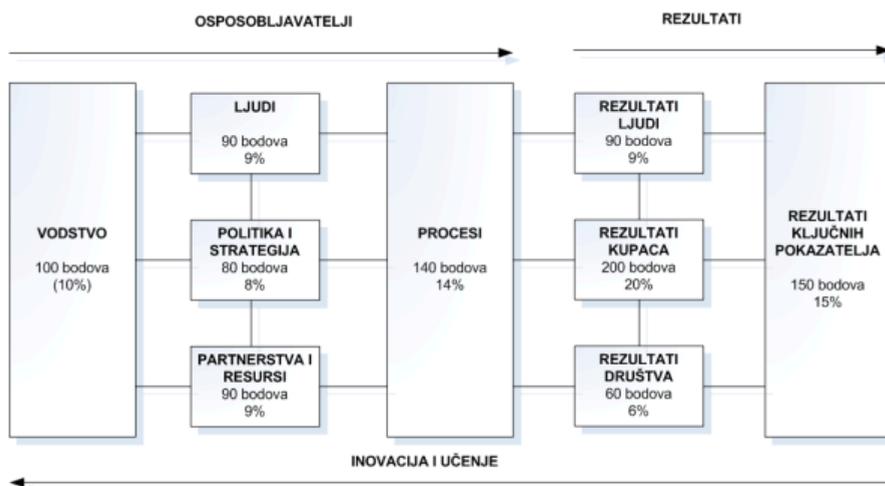
5. KOMPARATIVNA ANALIZA VERZIJA IZ 2013. I 2019.

EFQM model je doživio brojne nadopune i promjene tijekom godina postojanja, no ipak najznačajnija promjena dogodila se 2019. godine, kada je promijenjena struktura modela. Dolazi do promjene naziva modela, tako je model u prijašnjoj verziji nosio ime „The EFQM Excellence Model“, dok u novoj verziji nosi ime „The EFQM Model“. Kao što se vidi izostavljena je riječ „Excellence“ (izvrsnost).

Također dolazi do nastajanja drugačijih skupina kriterija, promjenama u broju kriterija, a time i do promjena u nazivima pojedinih kriterija i njihovog obuhvata. Stara struktura modela temeljeni se na podjeli kriterija u dvije skupine: osposobljavatelji / preduvjeti / omogućitelji (aktivnosti i procesi organizacije) i rezultati (postignuće organizacije). Obje skupine zajedno imaju 9 kriterija, skupina „Preduvjeti“ obuhvaća prvih 5 kriterija (vodstvo, ljudi, politika i strategija, partnerstva i resursi, procesi), a skupina „Rezultati“ obuhvaća preostalih 4 kriterija (rezultati ljudi, rezultati kupaca, rezultati društva i rezultati ključnih pokazatelja).

¹⁹ <https://www.qualityindeed.com/download/publications/25.pdf> (17.01.2022.)

Slika 3. Stara struktura EFQM modela

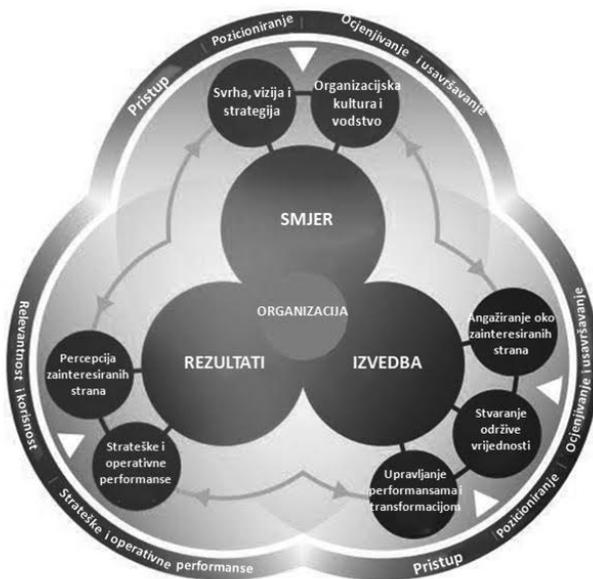


Izvor: EFQM.

Dok se nova struktura sastoji od tri skupine kriterija, a to su: smjer, izvedba i rezultati. Sve tri skupine kriterija zajedno imaju 7 različitih kriterija, tako se u skupini „Smjer“ nalaze dva kriterija svrha, vizija i strategija te organizacijska kultura i vodstvo, u skupini „Izvedba“ nalaze se tri kriterija angažiranje oko zainteresiranih strana, stvaranje održive vrijednosti te upravljanje performansama i transformacijom, u posljednjoj skupini kriterija „Rezultati“ nalaze se dva kriterija percepcija zainteresiranih strana te strateške i operativne performanse. Kako bi se lakše shvatile promjene koje su nastale u nastavku su na slikama 3. i 4. grafički prikazane strukture i starog i novog oblika modela.²⁰

²⁰ Sebastian – Ivan Godina, *EFQM model – komparativna analiza stare i nove verzije modela*, diplomski rad, Sveučilište Sjever, Koprivnica, 2021.

Slika 4. Nova struktura EFQM modela



Izvor: EFQM.

EFQM Excellence Model (starija verzija) obuhvaća tri integrirane komponente:

- Temeljni koncepti izvrsnosti. Njih čini osam ključnih načela organizacijske izvrsnosti: dodavanje vrijednosti za korisnike, stvaranje održive budućnosti, razvijanje organizacijske sposobnosti, koristiti kreativnost i inovaciju, vođenje s vizijom, inspiracija i integritet, upravljanje sa spretnošću, postizanje uspjeha kroz talentirane ljude i održavanje izvanrednih rezultata.
- Kriteriji kao okvir koji omogućuje organizacijama da primjenjuju temeljne koncepte u praksi (9 glavnih kriterija i 32 podkriterija se nalaze u tom okviru).
- RADAR logika kao dinamičan okvir ocjenjivanja koji omogućuje izračunavanje sveukupnog stupnja izvrsnosti određene organizacije, odnosno njezine zrelosti.²¹

S druge strane, EFQM Model (nova verzija) ne obuhvaća koncepte izvrsnosti eksplicitno, već su oni integrirani i sakriveni unutar različitih sekcija novog modela. RADAR logika je uglavnom ostala onakva kakva je i bila, kao prirodni dio modela.²²

²¹ Ibidem.

²² Ibidem.

Bodovanje kod novog modela se sastoji od ukupno 1000 bodova, što je jednako kao i kod ocjenjivanja organizacijske zrelosti kod starog modela (putem samoocjenjivanja ili ocjenjivanja od treće strane).²³

Interakcija strateške prirode modela (obuhvaćenih u kriteriju 1 i 2) i operacijske performanse (kriteriji 3, 4 i 5) ili rezultata organizacije (kriteriji 6 i 7) predstavlja jedno znamenito obilježje. Uzročno – posljedične veze su znatno više istaknute u novome modelu što bi moglo doprinijeti većem prihvaćanju modela na svim razinama menadžmenta i akademske zajednice.

Druga impresivna promjena je ona pod pojmom „održiva vrijednost“. Taj pojam pretežno zamjenjuje riječi poput „proizvod“ i „usluga“. Iako je pojam „održiva vrijednost“ manje prisna korisnicima modela, on je ipak u većoj mjeri općenit i naglašava nužnost proizvodnje i isporuke *outputa* koji daju stvarnu vrijednost ne samo klijentima, već i drugim zainteresiranim stranama.

Još jedna pozitivna promjena je ona po pitanju „Rezultata“, svi rezultati koji se odnose na percepciju zainteresiranih strana (koja se ostvaruje kroz efikasne povratne informacije) su koncentrirani u jednom glavnom kriteriju – kriteriju 6. To je znatno drugačije od situacije u prethodnom modelu, gdje su spomenuti rezultati raspršeni u tri različite skupine kriterija rezultata.²⁴

Tablica 3. Prikaz razlika stare i nove verzije EFQM modela

Promjena	2013.	2019.
Ime	The EFQM Excellence Model	The EFQM Model
Skupine kriterija	2	3
Kriteriji	9	7
Temeljni koncepti izvrsnosti	Eksplicitni	Implicitni
Bodovanje	1000 bodova	1000 bodova
Rezultati (zainteresiranih strana)	Koncentrirani u jednom kriteriju	Raspršeni u više kriterija
Pojmovi (primjer)	Proizvod / usluga	Održiva vrijednost

Izvor: Izradio autor prema: Jaroslav Nenadál, „The new EFQM model: What is really new and could be considered as a suitable tool with respect to quality 4.0 concept?“, *Quality Innovation Prosperity – QIP*, 2020. i Sebastian – Ivan Godina, EFQM model – komparativna analiza stare i nove verzije modela, diplomski rad, Sveučilište Sjever, Koprivnica, 2021.

²³ Ibidem.

²⁴ Ibidem.

Nova verzija EFQM modela ima svoje brojne pozitivne strane (u nastavku je navedeno nekoliko primjera), no isto tako postoje i određene kritike nove verzije (u nastavku je također nabrojano par primjera).²⁵

U sklopu pojedinih točaka vodilja pojavljuje se novi pojam „ekosustav“. Taj pojam je objašnjen kako slijedi: „temeljni princip ekosustava je međuzavisnost, tj. nešto što se dogodi u jednom dijelu sustava može utjecati na druge dijelove unutar tog sustava. U kontekstu organizacije postoji mnogo vanjskih faktora koji utječu na njezino djelovanje“. Što to točno znači? Očito je da se u ovome kontekstu pojam ekosustav ne odnosi na ekološki segment, već se koristi za označavanje vanjskih pitanja konteksta organizacije u smislu ISO 9001 norme. Taj pojam bi mogao uzrokovati nesporazume u praksi.²⁶

Osim prethodno navedene kritike može se identificirati i druge nedostatke, koji se uglavnom odnose na probleme razumijevanja pojedinih formulacija, nedostataka definicija određenih pojmova i dr.²⁷

No, novi model također ima i brojne prednosti u usporedbi sa starom verzijom. Vjerojatno najvažnija promjena je ona vezana za podržavanje i opskrbu kreativnošću i inovacijama. Minimalno 8 različitih točaka vezanih za kreativnost i inovaciju je koncentrirano u posebne podkriterije 2.3 i 5.3, kao reakcija na činjenicu da je mnogo Europskih poduzeća zanemarilo taj aspekt.²⁸

Određene preporuke vezane za rizik, tj. njegovu identifikaciju, analizu, evaluaciju i postupanja s njime nadilaze samo financijske rizike u novoj verziji EFQM modela. Sada se upravljanje rizicima odnosi na sve vrste rizika: pravne, društvene, virtualne i dr.²⁹

Kriterij 6. se u potpunosti temelji na sveobuhvatnim povratnim informacijama dobivenih od ključnih zainteresiranih strana, čija percepcija mora biti dobivena iz različitih izvora.³⁰

²⁵ Ibidem.

²⁶ Ibidem.

²⁷ Ibidem

²⁸ Ibidem

²⁹ Ibidem

³⁰ Jaroslav Nenadál, „The new EFQM model: What is really new and could be considered as a suitable tool with respect to quality 4.0 concept?“, *Quality Innovation Prosperity – QIP*, 2020.

6. ZAKLJUČAK

Cilj svake moderne organizacije jest održivost, no jednako tako na organizaciju djeluju brojni čimbenici vanjske okoline na koje organizacija nema utjecaj, a koji mogu organizaciju usporiti prema ostvarenju tog cilja. Uz to, brojni su akteri poslovne okoline, kao što je konkurencija, s kojom se organizacije istovremeno moraju suočavati. Iz svega navedenog, organizacija mora konkurirati suparnicima na tržištu na adekvatan način (mentalitet stalnog poboljšanja, unapređenje poslovanja), kao što i na adekvatan način mora reagirati na promjene odnosno upravljati promjenama. Zbog postojanja te potrebe, kod organizacija, razvijen je EFQM model koji im to nastoji omogućiti.

Budući da taj model postoji već nekoliko desetljeća on je doživio brojne revizije, promjene, nadopune i dorade kako bi se prilagodio novim okolnostima i potrebama, te tako ostao pravovaljan i prikladan za korištenje do danas. Te promjene i unaprjeđenje modela omogućile su brojne godine iskustva, istraživanja i prikupljena povratnih informacija. Iako je model doživljavao promjene tijekom cijelog svog postojanja, ipak najznačajniji skok se dogodio upravo na prijelazu iz verzije iz 2013. na verziju iz 2019. (koja je i trenutna verzija modela). U posljednjoj verziji su napravljene velike promjene na strukturi modela, kao što su promjene po pitanju: broja i naziva skupine kriterija (sa 2 na 3) te samih kriterija (sa 9 na 7), pristupa u pojedinim aspektima modela, korištenih pojmova i dr.

Budući da su tijekom istraživanja uočeni pojedini nedostaci aktualne verzije modela (neki od njih su istaknuti u radu) i kako se kontekst u kojem organizacije posluju nastavlja mijenjati potrebno je nastaviti razvijati, prilagođavati i usavršavati EFQM model. Kao preporuku za buduća istraživanja jest napraviti detaljnu analizu trenutnog modela s preporukama za poboljšanje.

Abstract:

EFQM MODEL – DEVELOPMENT OVERVIEW AND THE COMPARATIVE ANALYSIS OF THE LAST THREE VERSIONS OF THE MODEL

The EFQM model is a model by which an organization can improve its performance and manage change, thus achieving business excellence. The EFQM model is by its nature general enough to be implemented by a wide range of organizations, to which it brings numerous benefits (such as the mentality of continuous improvement). The EFQM model seeks to maintain its relevance and relevance in a variety of ways (minor changes, revisions, etc.). The paper deals with the structure of the model

according to the current version, which is indispensable for understanding the model, as well as the history that preceded the creation of the current version. The aim of this paper is to make a comparative analysis of the models from 2010, 2013 and 2019 and to present the development of the EFQM model that led to the last, current model. The purpose of the paper is to understand the model, as well as the changes it has gone through to be able to predict and understand the future development of the model.

Keywords: business excellence, EFQM model, change management, sustainable development.

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SUSTAVI UPRAVLJANJA KVALITETOM U ULOZI IZGRADNJE APSORPCIJSKOG KAPACITETA ORGANIZACIJE

QUALITY MANAGEMENT SYSTEMS IN THE ROLE OF BUILDING
THE ORGANIZATION'S ABSORPTION CAPACITY

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SAŽETAK

Dugotrajni proces globalizacije, mnogobrojne tehnološke inovacije, početak nove industrijske revolucije i epidemija koronavirusa smatraju se izazovnim egzogenim čimbenicima s kojima se organizacije susreću u posljednjih nekoliko godina. Unatoč činjenici kako mnoga poduzeća imaju implementiran sustav za upravljanje kvalitetom i certificirana su dugi niz godina, bez kontinuirane prilagodbe tržištu teško je moguće ostvariti održivu konkurentsku prednost. Svako naučeno iskustvo koje poduzeće uspješno pretvara u operativne i dinamičke sposobnosti vodi do stvaranja rutinskih procesa i razvoja apsorpcijskog kapaciteta kako bi se organizacija u budućnosti brže prilagođavala kriznim situacijama na tržištu. Pretpostavka je ovoga rada da apsorpcijski kapacitet može dugoročno stvoriti preduvjete unutar organizacije za stabilni i kontinuirani razvoj sustava za upravljanje kvalitetom kako bi se stekla održiva konkurentska prednost na tržištu.

Ključne riječi: upravljanje kvalitetom, apsorpcijski kapacitet, četvrta industrijska revolucija.

1. SUSTAVI UPRAVLJANJA KVALITETOM U TIJEKU ČETVRTE INDUSTRIJSKE REVOLUCIJE

Područje upravljanja kvalitetom utjecalo je na razvoj mnogih poduzeća i time postavilo standard poslovanja kao primjer ostalim organizacijama. Poštovanje normi i dostizanje vrhunca u proizvodnji proizvoda ili isporuci usluge smatra se poslovnom izvrsnosti. Poslovna izvrsnost utemeljena je na načelima potpunog upravljanja kvalitetom koje se odnosi na poboljšanje čitave organizacije i svih procesa i aktivnosti u njoj.

Stvaranje sustava za upravljanje kvalitetom i njegova implementacija u poduzećima bazira se na dvama ključnim aspektima: aspektu utjecaja na troškove i aspektu utjecaja na prihode. Utjecaj na troškove će u slučaju više kvalitete smanjiti pogreške, odnosno defekte te u konačnici smanjiti troškove kao krajnji rezultat. S druge strane, utjecaj na prihode podrazumijeva kako viša razina kvalitete proizvoda ili usluge povećava zadovoljstvo kupaca, što se pozitivno odražava na prihodovnu stranu poduzeća¹.

Kao posljedica globalizacije raste razina očekivanja kupaca, a poduzeća se mogu razvijati učinkovitim sustavom upravljanja kvalitetom koji će poboljšati poslovne procese i uspješno odgovoriti na zahtjeve kupaca. Jedan od novijih primjera na tržištu jest kastomizacija proizvoda (engl. *customize*), koja uključuje posebne zahtjeve kupaca na standardiziranim proizvodima.

I certificirana poduzeća trebaju razmotriti kako u budućnosti razviti sustav poboljšanja koji će bilježiti reklamacije i pohvale kupaca, što u određenom vremenskom intervalu može biti temelj poduzeća za buduće poslovanje. Ključno je napomenuti kako će kupac koji je zadovoljan korisničkom podrškom poduzeća gotovo sigurno opet kupiti uslugu ili proširiti postojeću, čak i ako na početku nije bio zadovoljan.

Sustav upravljanja kvalitetom temeljen na certifikatu ISO 9001:2015 zahtijeva da se prije certificiranja poduzeća prvo definiraju ciljevi poduzeća i razlozi uvođenja određenog sustava upravljanja temeljenog na ISO normi. U cijelom procesu potrebno je imati potporu najvišeg rukovodstva radi stvaranja promjene i usklađivanja potpore na razini svih zaposlenika. Naposljetku, navodi se kako je potrebno identificirati ključne organizacijske procese radi ostvarivanja ciljeva organizacije te ispunjavanja kupčevih potreba. Potrebno je spomenuti i normu ISO 31000:2018 koja procjenjuje postojeće prakse i procese upravljanja rizicima, procjenu svih nedostataka u poduzeću te daje prijedloge za poboljšavanje².

¹ Tončić Lazibat, *Upravljanje kvalitetom*, Znanstvena knjiga, Zagreb, 2009.

² International Standards Organization: ISO9001:2015–How to use it, dostupno na <https://www.iso.org/publication/PUB100373.html>, 2019.

Detekcijom najbitnijih elemenata za uspješnost poduzeća moguće je razviti sustav koji će biti održiv unatoč kriznim situacijama na tržištu poput globalizacije, epidemije ili disrupcije. Bitno je naglasiti kako razvojem četvrte industrijske revolucije područje upravljanja kvalitetom dobiva naziv *kvaliteta 4.0*. U tablici 1 navedeni su elementi razvoja kvalitete 4.0.

Tablica 1. Elementi razvoja kvalitete 4.0

Naziv procesa	Definicija
Proces upravljanja velikim količinama podataka (<i>big data</i>)	Prikupljanje, analiza i poslovno odlučivanje u industriji 4.0 podrazumijevaju veliki obujam podataka koji poduzeće može iskoristiti radi stjecanja konkurentne prednosti na tržištu. Na taj se način može poboljšati dizajn proizvoda jer na njega utječu potrebe kupaca koje se mogu iz podataka mapirati i analizirati. Pritom može pomoći i Kano model radi mogućnosti procesuiranja velike količine podataka, stoga u tom segmentu poduzeće može ostvariti korist kroz perspektivu dizajna.
Korištenje algoritama preskriptivne analize za metriku kvalitete	Omogućuje dvije razine ljudske intervencije u poslovnom odlučivanju. Takvi algoritmi korisni su u planiranju i procesu poboljšavanja kvalitete, daju razne mogućnosti s analizama potencijalnih scenarija u budućnosti. Algoritmi mogu pomoći i u planiranju kvalitete, kontroli kvalitete te poboljšavanju kvalitete uz internet stvari (<i>Internet of Things</i>).
Učinkovita vertikalna, horizontalna i cjelovita (<i>end-to-end</i>) integracija kvalitetom 4.0	Podrazumijeva fleksibilan ekosustav poduzeća s promjenjivim procesima proizvodnje. Takav ekosustav omogućuje dinamičku rekonfiguraciju pojedinih proizvoda na osnovi dobivenih ulaznih vrijednosti. Vertikalna integracija kvalitete 4.0 bazira se na planiranju, kontroli i poboljšavanju kvalitete. S druge strane, horizontalna integracija bazira se na planiranju kvalitete te kontroli i fokusu na organizacije koje sudjeluju u procesu stvaranja vrijednosti.
Korištenje kvalitete 4.0 radi stjecanja strateške prednosti	Koristeći digitalne alate, moguće je ostvariti konkurentsku prednost na tržištu poboljšavanjem kvalitete proizvoda i diferencijacijom proizvoda. Podaci o korištenju proizvoda omogućuju segmentiranje kupaca, kustomizaciju proizvoda, cjenovno određivanje i stvaranje dodatnih usluga. Kvaliteta 4.0 prati korištenje proizvoda tijekom životnog ciklusa. Dobiveni podaci životnog ciklusa dovede do boljeg dizajna proizvoda i usluga u budućnosti.

Kvaliteta 4.0 kao stil vodstva	Vodstvo treba prenijeti kontinuiranu inovativnost i učenje na zaposlenike kako bi se ostvarila poslovna izvrsnost. Potrebna je otvorenost tržištu i pristup tehnologijama koje mijenjaju različite industrije.
Trening za kvalitetu 4.0	Podrazumijeva pripremu poduzeća za tehnologije koje omogućuju konkurentnost na tržištu. U budućnosti se može očekivati korištenje pametnih naočala za upravljanje i kontrolu te pametnih rukavica za distribuciju i manipulaciju robe. Nadalje, očekuje se veće korištenje tehnologija u proizvodnji kao što su RFID, QR kodovi, autonomna vozila, dronovi, 3D pisači, VR sustavi, roboti itd. Za upravljanje takvim tehnologijama potrebna su tehnička znanja iz područja informacijske tehnologije te transformacijska znanja kao što su prilagodljivost, kritičko razmišljanje, kreativnost te socijalne vještine u vidu timskog rada i prijenosa znanja.
Organizacijska kultura kvalitete 4.0	Organizacijska kultura skup je normi, vjerovanja i vrijednosti zaposlenika poduzeća. Ona utječe na ponašanje zaposlenika i njihov radni učinak. Povezanošću zaposlenika i stvaranjem kohezije, kao i korištenjem dostupne tehnologije, omogućuje se stvaranje utjecaja poduzeća u području kvalitete 4.0.
Podrška vrhovnog menadžmenta kvaliteti 4.0	Omogućuje praktičnu primjenu navedenih načela te dovodi do kvalitete i učinkovitosti organizacije. Kvalitetu 4.0 potrebno je inkorporirati u strategiju organizacije, a sam uspjeh implementacije kvalitete 4.0 ovisi o prihvaćanju korisnika u cijelom lancu opskrbe. Podrška vrhovnog menadžmenta utječe i na percepciju zaposlenika o važnosti koncepta kvalitete 4.0, kao i samog uspjeha u konačnici.

Izvor: Sony et al., 2020.

Tradicionalni koncepti kvalitete trebaju pratiti promjene i izazove koje donosi četvrta industrijska revolucija. Poseban je naglasak na umjetnoj inteligenciji koja može pozitivno utjecati na optimizaciju i operativnu učinkovitost poduzeća i razvoj sustava kvalitete³.

Na postpandemijskom tržištu poduzeća se trebaju pripremiti za drukčije uvjete poslovanja. U početku s drastičnim smanjenjem potreba kupaca, regulatornim modifikacijama te promjenama u lancima opskrbe, a poslije i s rastom nezaposlenosti, kao i povećanom neizvjesnošću⁴.

2. APSORPCIJSKI KAPACITET ORGANIZACIJE

Apsorpcijski kapacitet je sposobnost asimilacije i iskorištavanja novih znanja koje je poduzeće steklo iz vanjskih izvora⁵. Poduzeća s visokom razinom apsorpcijskog kapaciteta učinkovito primjenjuju nova znanja radi provođenja inovativnih aktivnosti^{6,7}.

Apsorpcijski kapacitet upotrebljava ključne operativne i dinamičke sposobnosti. Nadalje, sadržava komponente bazirane na znanju, pri čemu oblikuje sadržaj i proces. Unutar operativnih sposobnosti potreban je apsorpcijski kapacitet kako bi se privuklo znanje izvan organizacije u organizaciju te radi skupljanja informacija koje će pomoći u razvoju budućih rutina. S druge strane, unutar dinamičkih sposobnosti potreban je apsorpcijski kapacitet jer će pomoći u usmjeravanju operativnih sposobnosti te stvoriti preduvjete za prethodno navedeni proces. Apsorpcijski kapacitet može biti ključni mehanizam za povezivanje sposobnosti u radikalnom tržišnom okruženju⁸.

³ Andrea Chiarini, „Industry 4.0, quality management and TQM world“, A systematic literature review and a proposed agenda for further research, *The TQM Journal*, 2020.

⁴ Carsten Lund Pedersen, Thomas Ritter, *Preparing your business for a postpandemic world*. *Harvard Business Review*, dostupno na: <https://hbr.org/2020/04/preparing-your-business-for-a-post-pandemic-world>, 2020.

⁵ Kevin Zheng Zhou, i Caroline Bingxin Li, „How strategic orientations influence the building of dynamic capability in emerging economies“, *Journal of Business Research*, Vol. 63, No. 3, 2010.

⁶ Ibid.

⁷ Akbar Zaheer, Geoffrey G. Bell, „Benefiting from network position: firm capabilities, structural holes, and performance“, *Strategic management journal*, Vol. 26, No. 9, 2005.

⁸ Lance R. Newey, Shaker A. Zahra, „The evolving firm: How dynamic and operating capabilities interact to enable entrepreneurship“, *British Journal of Management*, Vol. 20, 2009.

Nadalje, apsorpcijski kapacitet odražava se u četirima rutinskim operacijama, a to su akvizicija znanja, asimilacija, transformacija i eksploatacija⁹. Navedene četiri rutinske operacije utječu na operativne i dinamičke sposobnosti¹⁰. U tablici 2 objašnjen je utjecaj pojedinih procesa apsorpcijskog kapaciteta u organizaciji.

Tablica 2. Procesi apsorpcijskog kapaciteta u vrijednosnoj mreži

Vrijednosna mreža u procesima apsorpcijskog kapaciteta	Operativna sposobnost	Dinamička sposobnost
Glavni odgovorni	Projektni tim	Voditeljski portfelj tim
Akvizicija znanja	Pribavljanje znanja iz vrijednosne mreže.	Protok znanja i učenje iz operativne sposobnosti, kao i iskustvo vrijednosne mreže.
Asimilacija	Smislena izradba tijekom informacija radi razvoja vrijednosnog prijedloga te usmjeravanje na relevantne osobe u organizaciji.	Utvrđivanje svojstva znanja iz operativne sposobnosti koja naposljetku dovodi do ekspanzije, diversifikacije, smanjenja ili odbacivanja proizvoda i vrijednosnog prijedloga, kao i stečenoga znanja.
Transformacija	Korištenje vrijednosne mreže znanja za razvoj i obogaćivanje vrijednosnog prijedloga za tržište.	Korištenje pribavljenog i asimiliranog znanja za donošenje poslovnih odluka o sadašnjim i budućim portfeljima proizvoda.
Eksploatacija	Isporuka krajnjega vrijednosnog prijedloga na ciljano tržište.	Implementacija operativne sposobnosti utječe na odluke koje mogu širiti, dijeliti, smanjiti ili odbaciti akumulirani vrijednosni prijedlog znanja.

Izvor: Lance R. Newey, Shaker A. Zahra, „The evolving firm: How dynamic and operating capabilities interact to enable entrepreneurship“, *British Journal of Management*, Vol. 20, 2009.

⁹ Shaker A. Zahra, Gerard George, „Absorptive capacity: A review, reconceptualization, and extension“, *Academy of Management Review*, Vol. 27, No. 2, 2002.

¹⁰ Lance R. Newey, Shaker A. Zahra, „The evolving firm: How dynamic and operating capabilities interact to enable entrepreneurship“, *British Journal of Management*, Vol. 20, 2009.

Mnogi elementi utječu na oblikovanje karakteristika u okviru sposobnosti poduzeća. Kako bi se konceptualizirale sposobnosti poduzeća, potrebno je razmotriti tri najvažnije značajke sposobnosti poduzeća¹¹:

1. *Uspjeh i praksa* – sposobnosti su prepoznatljive jedino ako postoji izniman uspjeh organizacije. Također, razvidne su jedino prilikom djelovanja u praksi.
2. *Pouzdanost i vrijeme* – uz visoku razinu pouzdanosti razvijat će se intenzitet, frekvencija i interakcija određene sposobnosti.
3. *Kompleksnost i rješavanje problema* – podrazumijeva učinkovito rješavanje problema na razini cijele organizacije. Kompleksnost se odnosi na rješavanje problema i donošenje odluka prilikom neizvjesnosti. Potrebne su vrlo sofisticirane sposobnosti koje posjeduju *apsorpcijski kapacitet*.

Štoviše, dokazano je u akademskim istraživanjima kako apsorpcijski kapacitet, koji se dijeli na operativni i kognitivni, utječe na zatvaranje jaza u operativnim i kognitivnim prazninama organizacije¹².

Pristup poslovnomu okruženju poduzeća može biti usmjeren na smanjenje ili apsorpciju kompleksnosti^{13,14}. Pristup smanjenja kompleksnosti u poslovnom okruženju usmjeren je na unutarnje procese kako bi se provela priprema organizacije za promjenu u okruženju u budućnosti, dok je apsorpcijski pristup poduzeća usmjeren na razvoj kompleksnoga adaptivnog sustava s ciljem integracije potencijalnih konflikata u budućem vanjskom okruženju¹⁵.

Temeljna razlika ovih dviju sposobnosti razvidna je u činjenici kako se adaptivna sposobnost odnosi na rekonfigurirane resurse i procese koji će

¹¹ Georg Schreyögg, Martina Kliesch-Eberl, „How dynamic can organizational capabilities be? Towards a dual-process model of capability dynamization“, *Strategic Management Journal*, Vol. 28, No. 9, 2007.

¹² Dovev Lavie, „Capability reconfiguration: An analysis of incumbent responses to technological change“, *Academy of Management Review*, Vol. 31, No. 1, 2006.

¹³ Stern Neill, Daryl McKee, Gregory M. Rose, „Developing the organization’s sensemaking capability: Precursor to an adaptive strategic marketing response“, *Industrial Marketing Management*, Vol. 36, No. 6, 2007.

¹⁴ Max Boisot, John Child, „Organizations as adaptive systems in complex environments: The case of China“, *Organization Science*, Vol. 10, No. 3, 1999.

¹⁵ Stern Neill, Daryl McKee, Gregory M. Rose, „Developing the organization’s sensemaking capability: Precursor to an adaptive strategic marketing response“, *Industrial Marketing Management*, Vol. 36, No. 6, 2007.

odgovoriti na vanjske promjene, dok se apsorpcijska sposobnost smatra svojstvom učenja poduzeća koje iskorištava asimilaciju i znanje¹⁶.

3. ZAKLJUČAK

Kvaliteta 4.0, odnosno upravljanje kvalitetom uslijed četvrtke industrijske revolucije, bavi se procesom upravljanja velikim količinama podataka (*big data*), koristi algoritme preskriptivne analize za metriku kvalitete, bavi se učinkovitim vertikalnom, horizontalnom i cjelovitom (*end-to-end*) integracijom kvalitete 4.0, koristi digitalne alate radi stjecanja strateške prednosti, prenosi kontinuiranu inovativnost na zaposlenike, prilagođava se novim tehnološkim otkrićima radi stjecanja konkurentnosti, stvara novu organizacijsku kulturu i daje podršku vrhovnom menadžmentu u provođenju novih strategija.

Sustavi upravljanja kvalitetom unutar organizacije mogu biti temelj za izgradnju apsorpcijskog kapaciteta. Ukoliko su procesi unutar organizacije na efikasnoj i zadovoljavajućoj razini te se klijentu proizvod ili usluga isporučuju na kvalitetan način, pojava krizne situacije na tržištu može biti prilika za učenje i rast apsorpcijskog kapaciteta.

Kada u organizaciji raste apsorpcijski kapacitet, tada će uslijed kriznih situacija na tržištu postojati veća vjerojatnost brze prilagodbe tržištu. Kao što je navedeno, apsorpcijski kapacitet može biti ključan mehanizam u povezivanju sposobnosti poduzeća uslijed radikalnih promjena na tržištu. Točnije, većim apsorpcijskim kapacitetom moguće je na efikasniji način povezati rutinske operacije u poduzeću i time neometano vršiti isporuku proizvoda ili usluga klijentima.

Temelj razvoja apsorpcijskog kapaciteta, ali i ostalih procesa i aktivnosti u poduzeću ostaje sustav za upravljanje kvalitetom koji ne gubi značaj uslijed četvrtke industrijske revolucije. Upravljanje kvalitetom je budućnost mnogih proizvodnih i uslužnih poduzeća koja uslijed globalizacije, brojnih tehnoloških inovacija i kriznih situacija na tržištu poput epidemije nastoje sačuvati poziciju na tržištu i stvoriti održivu konkurentsku prednost.

¹⁶ Kevin Zheng Zhou, i Caroline Bingxin Li, „How strategic orientations influence the building of dynamic capability in emerging economies“, *Journal of Business Research*, Vol. 63, No. 3, 2010.

Abstract:

QUALITY MANAGEMENT SYSTEMS IN THE ROLE OF BUILDING THE ORGANIZATION'S ABSORPTION CAPACITY

The long process of globalization, numerous technological innovations, the beginning of a new industrial revolution and the coronavirus epidemic are considered to be challenging exogenous factors that organizations have been facing in recent years. Despite the fact that many companies have implemented a quality management system and are certified for many years, without continuous adaptation to the market it is difficult to achieve a sustainable competitive advantage. Any learned experience that a company successfully transforms into operational and dynamic capabilities leads to the creation of routine processes and the development of absorption capacity in order for the organization to adapt more quickly to market crises in the future. The assumption of this paper is that the absorption capacity can create long-term preconditions within the organization for stable and continuous development of the quality management system.

Key words: quality management, absorption capacity, the fourth industrial revolution.

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LEBANESE PUBLIC DEBT AS A BARRIER TO INTERNATIONAL INVESTMENTS: EVICTION EFFECT

LIBANONSKI JAVNI DUG KAO ZAPREKA
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ABSTRACT

The accumulation of external and domestic public debt affects the government's financial performance and the efficiency of the state's financial and monetary policies, as well as a host of other economic variables. public debt can have a major impact on the attractiveness of an individual economy in the context of investment. The higher the public debt, the lower the attractiveness of investing in such a system, and vice versa. Lack of investment can also mean lower economic growth and development, which can affect the quality of life of people living in a country with high public debt. All of the above can have a negative impact on the quality of management,

ie it can be a consequence of insufficient quality of management, which brings with it a large number of different risks. Based on that, the problem of this research was defined, which is the analysis of the impact of public debt on investments. The paper is based on secondary research, and the results of the survey indicated that public debt can have a significant impact on investment.

Key words: eviction, public debt, investment, public debt and quality.

1. INTRODUCTION

The accumulation of external and domestic public debt affects the government's financial performance and the efficiency of the state's financial and monetary policies, as well as a host of other economic variables. Such as private saving, private investment, total productivity of the factors of production, etc., in a way that this debt could become an obstacle to economic growth. In fact, the positions of the different economic schools differ on the nature of the effect that public debt exerts on economic growth. Some of these schools believe that this effect is neutral, some are positive, and some are negative (eviction effect). Most of those who are satisfied with the predominance of the negative impact of public debt on economic growth see that this effect mostly occurs at its high levels, and after it has reached a certain level. They call it the critical level of public debt. The eviction effect is, in general, the result of increased public sector activities to the detriment of the private sector.

Several schools of thought supported the analysis of the eviction effect. The classical school is the oldest, it stages the traditional approach of the effect of expulsion by the arguments of budgetary discipline. According to the classical school, budgetary discipline promotes the optimal allocation of resources and rational choices. The arguments of budgetary discipline, staged the traditional approach of the eviction effect. According to the authors of this school, public borrowing has a eviction effect, it reduces private investment. For Keynesians, the eviction effect results in the following situations: full employment, neutral monetary policy.¹ According to Liberal economists, the eviction effect is the negative consequence of the expansion of public sector activities more than the private sector. For them, there are two internal and external aspects to this effect. The internal effect is most cited for liberal econ-

¹ Pascal St-Amour, *Séminaire de Politique Macroéconomique (Implications économiques et financières de la dette, 2004.*

omists, especially to demonstrate that the increase in the budget deficit does not have a stimulating effect on the economy.² This effect relates to the effects of an increase in public expenditure, which can be financed by government securities issues. While the external effect, in an open economy, describes an identical process of private expenditure that allows the free movement of capital..

The professional contribution of the paper refers to the definition of indicators that can be used when analyzing the success of management or considering the costs that could have implications for the management of the organization. The scientific contribution of this paper is to create a basis for a different view of quality costs through the prism of all dependent costs that may arise, which can be the basis for further research related to quality costs.

2. PUBLIC DEBT

Public debt is the state's debt, it is the set of financial commitments made in the form of loans by a state. Public debt is often expressed as a percentage of Gross Domestic Product – (GDP) when it comes to measuring its economic importance. There are two types of public debt:

- Domestic public debt, held by economic agents resident in the issuing state;
- The external public debt, held by foreign lender.

A distinction is also made between short-term (one year or less), medium-term (up to five years) and long-term (over five years) debt.³

The main objective of public debt is:

- Reduce the cost of debt in the short, medium and long term. This cost is represented by repayments spread over time and by the flow of interest payments;
- Reducing short-and medium-term risks by ensuring that governments are able to meet their repayment obligations in one to two years.

In many countries, the management of the state's treasury differs from debt management. Managers centralize short-term spending and revenue forecasts (a few hours, days, weeks and months following), even in the event of disruptions, managers ensure that sufficient reserves are available.⁴

² Ibid.

³ André Grjebine, 2015. Récupéré sur https://fr.wikipedia.org/wiki/Dette_publicue

⁴ Michel Pébereau, 2006. Récupéré sur https://fr.wikipedia.org/wiki/Dette_publicu.

At the international level, the World Bank and the International Monetary Fund (IMF) are developing risk assessment, modelling and risk management tools for public debt management to help different countries to reform and improve their public debt management practices.⁵ One method used to reduce the cost of short-term debt is to exchange long-term instruments for short-term, more volatile but lower instruments. These transactions (swaps) may involve the exchange of fixed-rate instruments for variable-rate instruments or may involve the exchange of variable-rate instruments for fixed-rate instruments.⁶

3. EVICTION EFFECT

The effect of eviction as the effect of government borrowing absorbing a certain amount of financial resources available for investment, from within or outside the banking system, which leads to the Reinhart and Rogoff.⁷ The authors defined the effect of eviction as the effect of government borrowing absorbing a certain amount of financial resources available for investment, from within or outside the banking system, which leads to the exclusion of private investment. The philosophy of the eviction effect is based on the fact that government loans lead to an increase in the demand for national saving that was designated for private investment, and the depletion of an increasing part of it, and then the increase in the demand for saving with the constant supply of it leads to an increase in the market cost of interest rate, which leads to the decline in private investment, and with the continuation of government borrowing and the accumulation of more public debt, the displacement effect may reach a point where only the government and its various bodies are able to borrow, due to the extremely high interest rate with which the individual establishments and institutions are unable to compete, and then they are removed from the market. With money, private investment is greatly reduced, and hence the rate of economic growth.⁸ Based on the above, it can be said that the eviction effect is a complex, multi-faceted effect that is not limited

⁵ Ibid.

⁶ Jacques Attali, 2010. Récupéré sur https://fr.wikipedia.org/wiki/Dette_publicue.

⁷ Carmen M. Reinhart, Kenneth S. Rogoff, “Public Debt Overhangs: Advanced - Economy Episodes Since 1800”, *Journal of Economic Perspectives*, Vol. 26, 2012, pp 69-86 .

⁸ Muhammad Mustapha Abdullahi, Nor’aznin A. Abu Bakar, Sallabuddin B. Hassan, “Debt Overhang versus Crowding Out Effects: Understanding the Impact of External Debts on Capital Formation in Theory”, 2016, *International Journal of Economics and Financial Issues*, 6(1), pp 271-278.

only to reducing the amount of money available to the private sector, nor to raising the interest rate on it. Rather, it extends to negatively affect public investment, which in turn has an additional effect on private investment. This mechanism contributes to a decrease in the growth of capital accumulation, a decrease in productivity, and a decline in the rate of economic growth.

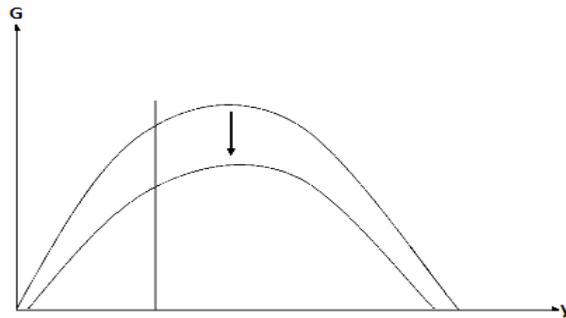
3.1 Traditional Approach to eviction effect

The classical school, staged the traditional approach of the effect eviction by the stage arguments of budgetary discipline. According to the classical school, budgetary discipline promotes the optimal allocation of resources and rational choices. The arguments of budgetary discipline, staged the traditional approach of the eviction effect. Buchanan distinguished two kinds of citizens: The former have a moral responsibility to the debts incurred by their state, because they participated in the decision-making process that generated the expenditure. The second do not have a responsibility because they are not involved in this decision. According to the classical school, public borrowing has a eviction effect, it reduces private investment. Borrowing increases interest rates, and a decrease in funds available to private agents due to increased demand for credit, leads to a decrease in private investment, and GDP. However, two conditions are necessary:

- Investment is a function of the interest rate;
- Demand for money is not elastic.

Public spending is financed by a fixed tax (it does not change the interest rate or marginal productivity of capital). The evolution of consumption does not change, only the budgetary constraint of the consumer is affected by taxes. Consumption must be reduced at the same level as public spending to stabilize the new state, and the only effect is that public spending is putting pressure on private consumption spending.

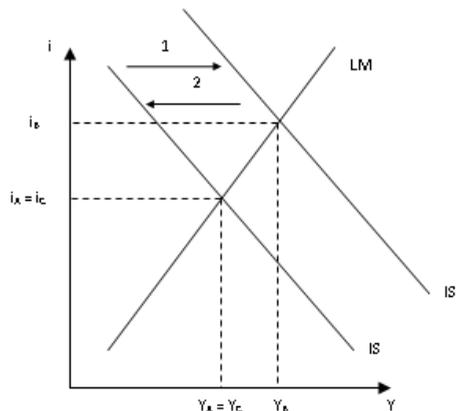
Figure 1. Public spending in the Ramsey model (1928)



(Y=revenue, G=public expenditure)

The rational consumer knows that the state must raise taxes to repay the loan. The rational assumption of the rational consumer suggests that it considers the short-and long-term effects of economic policy once implemented, thus affecting their behaviour and the impact of debt. According to Ricardo, the way in which public spending is financed does not affect the economy. Thus, when the government reduces taxes, agents expect future tax increases to allow it to repay its debt. They will therefore save the discounted amount of this refund and their consumption. Private savings replace public savings the income of the economy is not affected.

Figure 2. Public debt in the IS-LM model (Ricardian Equivalence)



(i = interest; Y = revenue)

Debt formation will therefore have no impact on the economy. A similar reason for the increase in government spending by incorporating this parity into the IS/LM model, we note that tax reductions will only have a positive transitional effect on gross income.

4. LEBANESE PUBLIC DEBT

These are the characteristic of the Lebanese public debt, at the cyclical level:

- The price seems sensitive to the magnitude of financial flows and little affected by the level of debt.
- In terms of risk, the debt is entirely internal and banking. The effect of a crisis can be very bad.
- At the economic level, the phenomenon of the eviction of financing from private activities by that of public debt, seems to be more dependent in reality on the saturation of credit to to the private sector.

4.1. The dynamics of Lebanon's public debt

Lebanon's public debt dynamics are not as simple as the simple calculation of debt and budget deficits suggests. The annual amounts of the fiscal deficit must be compared to annual changes in debt including reductions by the central bank deficits. In general, Lebanon's public debt grows each year more than the budget deficit. This is due to the central bank's monetary policy of tying the pound to the dollar: If depositors convert their deposits into pounds, the amount of the pound becomes surplus in the market and the central bank has a position to borrow books to sterilize them. If they convert their deposits into dollars, the central bank has an inclination to borrow dollars to renew its foreign exchange holdings. But some exceptions emerged in the years: 1997, 2000 and 2007, when the deficit increased more than the debt. This is due to several reasons since the easing of monetary tensions, which has led to the use of assets formerly accumulated in pounds or foreign currencies, including the allocation of certain expenses for previous years, for reasons of political manipulation, to the extent of hiding certain tax expenditures by charging them to the Central Bank.⁹

⁹ Charbel Nahas, „Le Liban est déjà dans une dynamique de crise“, Le Commerce de levant, 2018.

4.2. The main components of Lebanon's public debt

There are five main components of public debt:¹⁰

- In the early 1990s, domestic financing in Lebanese books amounted to almost 90% of public debt.
- Exceptional measures began to increase in 1997, and expect 10% in 2003, with the effects of the Paris III conference.
- The central bank's domestic, direct or intermediate financing in foreign exchange and pound is a sign of difficulties in debt financing.
- Domestic foreign exchange financing increased between 1996 and 2001, due to the growing need for bank financing.
- External financing ranges from 10% to 15% of total debt, including financing of investment projects.

4.3. The stations of the Lebanese public debt

Throughout the period of independence, Lebanon had no public debt, other than some loans for project financing. Total pre-war public debt was 3% of GDP (equivalent to \$400 million today). The increase in public debt began later and passed through 3 stations:

- *First:* 1993 to 2004, when the public debt increased from 3 to 36 billion dollars, because of the policy of borrowing to invest.
- *Second:* 2005 to 2016, as the public debt rose to more than \$ 75 billion due to the policy of spending with funds from outside the budget and under the influence of political confusion and a decline in economic activity.
- *Third:* 2017 to March 2018, the public debt rose to \$ 82.3 billion because of previous policies, but also because of the continuous increase in public spending (more than 25,000 employees in the public sector in the last three years).

During all these milestones, public spending was increasing more than the state's income, which led to the creation of a chronic deficit that turned into a public debt. (Economic growth was unable to absorb this deficit due to the absence of economic policies, but also because of the absence of budgets from 2006 to 2016 (\$ 37 billion). But the most important thing in all that happened was that the political confusion was being resolved every time at the

¹⁰ Ibid.

expense of the public treasury, which created a culture of spending especially after the July 2006 aggression.¹¹

4.4. Economic activity in Lebanon compared to the public debt

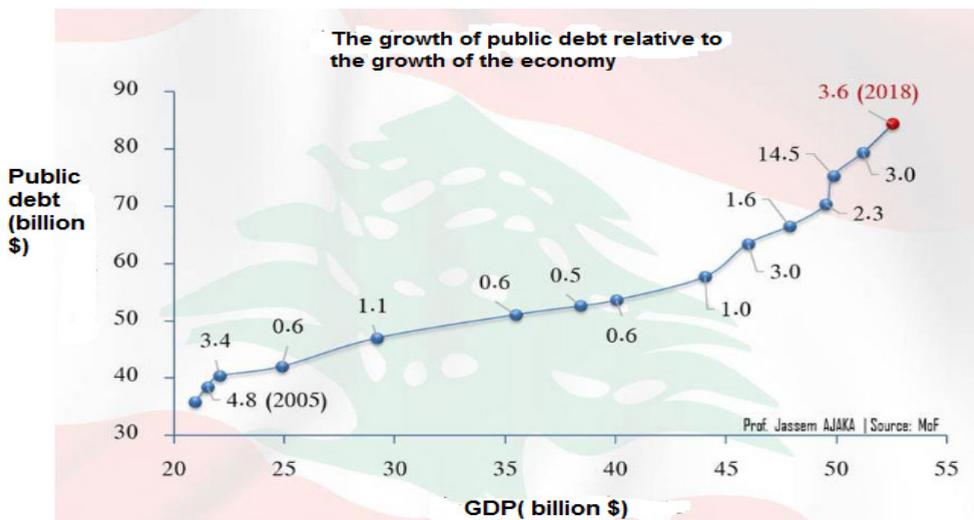
In terms of economic activity, Lebanon has made significant progress influenced by the policy of borrowing for investment, which translated into a rise in GDP from \$7.5 billion in 1993 to \$21 billion in 2004. The assassination of President Rafik Hariri and the July 2006 aggression curbed economic growth and remained at \$21 billion, driven by the well-known principle of the economy. However, from 2007 to 2010, the economy grew in two digits, driven by foreign direct investment, and GDP increased to \$38.5 billion. The years following (2011 to 2014) also saw growth due to investment benefits, which were reduced to \$49.5 billion in 2015 and since then, economic growth has been 1 to 1.5%. Comparing the growth of public debt and GDP growth leads to an obvious conclusion, which is that economic growth was not sufficient to absorb the budget deficit, which led to an increase in public debt and with it the service of the latter. However, the most difficult issue is that the successive governments (with the exception of the government of President Salim al-Hoss in the year 2000) did not implement any measures to curb public spending, as the wages item doubled between 2007 and 2016 to reach \$ 4.89 billion annually! In addition, the support provided by the state to the EDL over the same period amounted to 16 billion dollars, draining the state's treasury, which recorded more than \$ 122 billion in spending (over the same period). A comparison of historical data for public debt and GDP shows a rise in public debt relative to a rise in gross domestic product, which fluctuates from one year to the next. For example, in glory days (2007-2010), the percentage was less than 1%, while it increased to 3% in 2013 and 14.5% in 2016, only to return to 3% in 2017. It is expected, according to statistical simulations, that this percentage will increase in the year 2018 was to 3.6%, in the absence of any measures until the end of August 2018.¹²

¹¹ Jassim Ajjaka, 2018.

<https://www.imlebanon.org/2018/06/25/no-sustainability-of-public-finances-without-stimulating-investments/>

¹² Ibid.

Figure 3. The growth of public debt relative to the growth of the economy



The costs of quality in transport and logistics can be seen as hidden costs and visible costs. Hidden costs are all dependent costs that may arise due to problems, ie non-compliance, while visible costs refer to all direct costs whose amount can be easily calculated. Table 1 shows examples of quality costs that may occur in transport and logistics. Table 1 shows that the costs of quality in logistics are partly determined by the costs that occur in transport, ie transport infrastructure. The reason for this primarily lies in the fact that distribution logistics uses transport infrastructure which, due to its congestion or poor quality, affects the performance of distribution logistics.

4.5. Catastrophic consequences of increasing public debt (critical level)

Krugman¹³ defined the phenomenon of the super-year debt as the situation in which the state is unable to service its debts, where the current value of the public revenues expected in the future is less than the value of the outstanding balance of the public debt, and in which the debt service payments are exhausted from a very large aspect. Public debt becomes superfluous when its level exceeds its critical level, creating negative effects on economic growth, as a result of increasing uncertainty about the state's ability to pay the

¹³ Paul R. Krugman, "Financing vs. Forgiving a Debt Overhang", National Bureau of Economic Research, *Working Paper*, NBER, No. 2486, 1988, pp 10-4.

installments and interest on its debts. And the super public debt, in the opinion of Ntshakala¹⁴, represents the main reason for slowing economic growth in highly indebted countries, as it creates negative incentives for private and public investment, which is also confirmed by Abdullahi¹⁵ and Serieux and Samy.¹⁶ As for a mechanism that achieves this negative impact on investment incentives, Ogonna et al¹⁷ explains that in light of the phenomenon of super-debt, everyone realizes that the burden of public debt in the future will be very high, to the extent that it discourages current investment, whether this investment is private or public. The reason why investors believe that the profits of new projects will be exposed to high rates of taxes; In order to service the public debt, while public investment declines due to the acquisition of public debt service payments on an increasing part of public revenues and the decrease in the government's incentives to implement reform and economic stability policies.

4.5.1. Case of Lebanon

The main factors determining the critical level of public debt in Lebanon, are:

1. The structure of public debt.
2. The trend or path of public debt.
3. Aspects of spending the proceeds of public debt.
4. Efficiency of economic institutions and policies (economic stability).
5. The level of idle resources in the economy.
6. Level of National Income.
7. Nature of the political system.

¹⁴ Precious Lomagugu Ntshakala, „Effects of public debt on economic growth in Swaziland”, *International Journal of Business and Commerce*, Vol. 5, No. 1, 2015), pp 1-2.

¹⁵ Muhammad Mustapha Abdullahi, Nor'aznin A. Abu Bakar, Sallabuddin B. Hassan, “Debt Overhang versus Crowding Out Effects: Understanding the Impact of External Debts on Capital Formation in Theory”, 2016, *International Journal of Economics and Financial Issues*, 6(1), pp 271-278.

¹⁶ John Serieux, Yiagadeesen Samy, “The debt service burden and growth: Evidence from low income countries”, World Institute for Development Economics Research, Development Conference on Debt Relief, Helsinki, 2001.

¹⁷ Igberi C. Ogonnal, Odo Stephen Idenyi, Anoke Charity Ifeyinwa, Nwachukwu Udochukwu Gabriel, “The Implications of Rising Public Debt on Unemployment in Nigeria: An Auto Regressive Distributed Lag Approach”, *Asian Research Journal of Arts & Social Sciences*, Article no. ARJASS.26394, 2016, pp 1-15.

The increase in public debt accelerated in the first three months of 2017, with a monthly average of \$1 billion compared to \$185 million in 1998 and \$400 million in 2016. This acceleration is a bad omen that the Lebanese state must do to curb spending and stimulate economic growth to increase its tax revenues. And this debt also accelerated in the first three months of 2018 to \$3 billion compared to an annual rate of \$3.1 billion! This pace threatens to enter the “issy” escalation phase, which, in the absence of effective action, will have catastrophic consequences. Public debt, with taxes, is the means for governments to finance their budgets, and economic theory states that these incomes are the only ones that are recognized in the absence of natural resources. Thus, the coverage of state spending consisting of public spending and servicing of public debt requires that these incomes be higher than state spending so that there is no budget deficit. The problem of financing through borrowing requires careful management of public spending on the one hand that the lack of control over this expenditure increases the value of the public debt and thus the servicing of the public debt, which means total state spending. This brings the state’s finances into a vicious circle that imposes indebtedness and increases spending, which means increased indebtedness, to enter the public debt in the acceleration phase of “Exponential” which makes it difficult to curb this acceleration except by austerity measures like those in Greece, which impose saline social reality.

The value of interest on public debt paid by Lebanon from November 1998 to the end of 2017 was \$71 billion! In 2017, public debt service was valued at \$5 billion compared to \$195 million in debt repayments, reflecting the rapid increase in public debt resulting from the transformation of public debt service into public debt. Lebanon has reached this high and critical level of public debt, which stands in the way of domestic and foreign investments due to the often inappropriate use of debt, and among other factors, the investment climate in Lebanon is characterized by:

- Massive social ills and corruption in all public sectors such as the electricity sector, which has so far cost the state about \$40 billion and other sectors (telecommunications, health, education...), bureaucracy, insecurity and suspicious transactions, thefts and large waste of public funds in state institutions and ministries. The indiscriminate recruitment of state sectors, which is mostly based on political and sectarian favouritism, has greatly inflated the sector.
- It can be concluded that our findings are in agreement with the Keynesian logic that is announced: the impact of debt growth on growth is positive in the short term because public debt has no cost

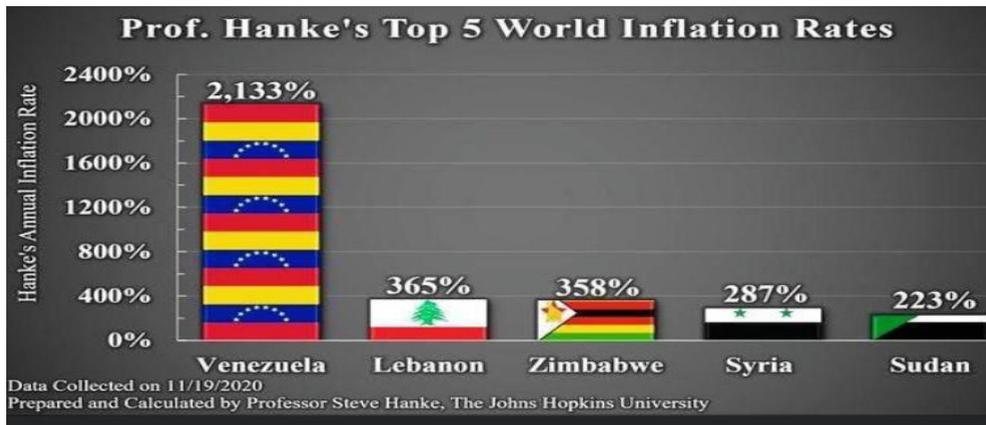
and causes the growth of public spending (state-granted credit) that can encourage investment, consumption and reduce unemployment, but in the long run this increase in spending translates into a eviction effect in the developing country (Lebanon) because this debt does not move significantly towards productive sectors (industry, agriculture and infrastructure...) which it is the main driver of economic growth.

4.5.2. The current situation in Lebanon

Despite various attempts by the international community to help Lebanon, such as the Paris 1 and Paris 2 conferences, donations and loans from the World Bank and Arab countries, the economic and financial situation has been worsened negatively by the political turmoil that Lebanon has been going through for several years. The large and critical accumulation of the Lebanese debt led to the current collapse in the economic and financial situations, where the exchange rate collapsed against foreign currency (before the great collapse, every 1\$= 1500 Lebanese pounds, now 1\$ = 8000 Lebanese pounds), which was the main reason for the popular uprising on 17 October 2019, which demanded the departure of the political class responsible for this collapse. This collapse led to the flight of a large part of the capital from Lebanese banks to abroad, where the reserves of foreign exchange in banks decreased by almost half, resulting in a decrease in internal and external investments by about 80%. Also, because of this huge increase in debt, the Lebanese state has not been able to meet its debt (euro bond bonds), which the government of Hassan Diab has taken to postpone the due payment in 2020 to the 2nd month of 2021. The situation worsened with the explosion of the Beirut port on August 4/ 2020, which led to the resignation of Hassan Diab's government. The visit of French President Emmanuel Macron comes in this context to encourage the Lebanese to unite and be patient in these difficult times, and to urge them to accelerate the formation of a comprehensive government capable of extricating Lebanon from the suffocating crisis. And repairing the damage caused by the explosion and making the necessary reforms in public finances, which the World Bank requested to provide assistance to Lebanon to help it overcome this stifling crisis, and President Macron promised to prepare for a new international conference in France (Cedar) in the event of expediting the formation of this government. But unfortunately the financial and economic situation is like a stroke. None of the politicians is responsible for the situation. And it was remarkable that the American economist, Professor Steve

Hank, commented on Twitter recently about the explosion in the Port of Beirut and the events that followed, saying: “It is shocking to watch Lebanese politicians do not care about the situation while Beirut burns.”

Figure 4. Top 5 World Inflation Rates



He noted that Lebanon surpassed Zimbabwe to become the second largest inflation rate in the world. Lebanon’s inflation rate was around 365%, ahead of Venezuela, which ranks first in the world with 2133%.

5. PUBLIC DEPT IMPACT ON QUALITY MANAGEMENT

If we look at the quality of management and public debt, the increase in public debt is a consequence of the insufficient quality of management. In other words, uncontrolled growth of public debt can mean incompetence in managing the system, and competence is one of the fundamental characteristics of quality management. Furthermore, as public debt results in increased business risk in the context of reduced attractiveness of investing in organizations operating in the Lebanese economy, there is also a lower probability that organizations will invest in the development of other organizations. Increasing the risk can also mean reducing the number of organizations interested in cooperation, which can hurt business.

Given the impact that risk may have on the organization’s operations, and taking into account the requirements of ISO 9001:2015 which addresses the need to consider risk and the impact that risk may have on the organiza-

tion's operations, to reduce business risk due to public debt, organizations must define mitigation plans that are often not sufficient as they cannot address risks at the economy level. However, the existence and development of such mitigation plans can also mean high costs for the organization.

Furthermore, if the link between public debt and the possibility of an organization being selected as an external supplier of services or products is considered, an increase in public debt and an increase in risk also means a reduction in the likelihood of choosing such an organization. The reason for this may be a thorough approach of the organization's management that considers potential suppliers, and which is based on the engagement of those suppliers whose business risk is low. Consideration of the risk of the service provider is especially important since the organization that hired an external supplier is responsible for the services and products as well as the processes that take place in the organization. In other words, if there is an impact of public debt on the organization in terms of increasing risk, the external supplier organization is less likely to be able to meet the requirements, which means that fewer organizations will consider the possibility of engaging such an organization.

6. CONCLUSION

The critical level of public debt varies among different countries, and even varies within the homogeneous groups of these countries (e.g. developed or developing countries). The critical level of public debt varies among different countries, and even varies within the homogeneous groups of these countries (e.g. developed or developing countries). This fact arises with the conviction that the critical level of public debt is a state-specific situation, determined by its own circumstances. The disparity in the level of critical debt can be explained by factors other than the size of the debt itself; these factors make the impact of the same level of public debt positive in one country, while it is neutral in another, or negative in another.

The efficiency of economic institutions and policies, economic stability are the most important factors that determine how public debt affects growth, determine the existence or absence of the critical level of public debt, as well as its level of existence. The difference in the structure of public debt from one country to another, the different aspects of spending on public loans, in addition to the level of democratic practice, and the extent of the existence of idle resources or savings in the economy, are some of the most important factors explaining the difference in critical debt levels between different

countries. In Lebanon, for many years, a rent-based economy has been built in Lebanon based on the banking and tourism sectors and the neglect of the productive sector (agriculture, industry, trade..) Public debt has had a positive impact in the short term, but in the long run it has had a very negative impact (eviction effect).

However, the rise of public debt in Lebanon and its critical level had a catastrophic impact, as it stood in the way of both foreign and domestic investments. In addition to among other factors, the investment climate in Lebanon is characterized by: Massive social ills and corruption in all public sectors (electricity, communications, health, education...), bureaucracy, insecurity and suspicious transactions, thefts and the large waste of public money in various state institutions and ministries, indiscriminate employment in state sectors, which depends mostly on political and sectarian favouritism. The great collapse that Lebanon is experiencing these days has hit the banking and tourism sectors, which have worsened with the spread of the Corona epidemic, making the situation more difficult in the face of foreign investments. Based on the above, the Lebanese government should pay more attention to other institutional and economic factors that can affect the nature of the relationship between public debt and economic growth, thereby contributing to determining the critical level of public debt, and future studies should measure the nature and degree of the relationship between each factor and the critical level of public debt. Finally, the research identified how public debt can be the result of poor governance and how it can affect the organization in terms of increasing risk, which means the need to define measures aimed at reducing or mitigating risk.

Sažetak:

LIBANONSKI JAVNI DUG KAO ZAPREKA MEĐUNARODNIM ULAGANJIMA: UČINAK ISELJENJA

Akumulacija vanjskog i unutarnjeg javnog duga utječe na financijski učinak države i učinkovitost financijske i monetarne politike države, kao i na niz drugih ekonomskih varijabli. javni dug može imati velik utjecaj na atraktivnost pojedinog gospodarstva u kontekstu ulaganja. Što je veći javni dug, to je manja atraktivnost ulaganja u takav sustav, i obrnuto. Nedostatak investicija može značiti i niži gospodarski rast i razvoj, što može utjecati na kvalitetu života ljudi koji žive u zemlji s visokim javnim dugom. Sve navedeno može negativno utjecati na kvalitetu upravljanja, odnosno može biti posljedica nedovoljne kvalitete upravljanja, što sa sobom nosi veliki broj različitih rizika. Na temelju toga definiran je problem ovog istraživanja, a to je analiza utjeca-

ja javnog duga na investicije. Rad se temelji na sekundarnom istraživanju, a rezultati istraživanja su pokazali da javni dug može imati značajan utjecaj na ulaganja.

Ključne riječi: iseljenje, javni dug, investicije, javni dug i kvaliteta.

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AUDIT PROCESA TRAJNOG POBOLJŠAVANJA ORGANIZACIJE

AUDIT OF THE PROCESS OF CONTINUOUS IMPROVEMENT OF THE ORGANIZATION

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Jezik/*Language*: Hrvatski/*Croatian*

SAŽETAK

Trajno poboljšavanje sustava upravljanja kvalitetom trebalo bi dovesti do povećanja razine zrelosti organizacije za kvalitetu. Time se izlazi iz okvira ispunjenja zahtjeva norme ISO 9001:2015. pa je potrebno uspostaviti nove smjernice kojima se može utvrditi trajni uspjeh organizacije kao posljedicu trajnog poboljšavanja. Drugim riječima treba u sustav upravljanja kvalitetom uključiti i druge parametre koji omogućuje mjerenje trajnog uspjeha organizacije u svakom trenutku. Norma ISO 9004:2018. je utvrdila smjernice za izgradnju povjerenja u sposobnost organizacije da postigne trajni uspjeh. Naravno pored tih smjernica u audit procesa poboljšavanja treba uključiti i ekonomske pokazatelje kojima se dokazuje da li organizacija postiže kontinuiran uspjeh kroz proces poboljšavanja. Da bi se auditom procesa trajnog poboljšavanja utvrdila sukladnost stanja zrelosti s novim zahtjevima utvrđenim u procesu potrebno je imati novi metodološki pristup takvom auditu. Iz tih razloga se u radu prikazuje mogući metodološki pristup auditu procesa trajnog poboljšavanja

što ima cilj potaknuti sve one koji se bave upravljanjem kvalitetom da doprinesu usavršavanju metodologije audita procesa trajnog poboljšavanja organizacije. Autori ovoga rada su uvjereni da se ovim radom otvaraju nove dimenzije u auditu procesa trajnog poboljšavanja, a posebna korist će biti organizacijama za provođenje internog audita koji mora biti u funkciji rasta i razvoja organizacije.

Ključne riječi: audit trajnog poboljšavanja, razina zrelosti organizacije, trajni uspjeh organizacije.

1. UVOD

U zahtjevima norme ISO 9001:2015 – točka 10.3 kaže se: „Organizacija mora trajno poboljšavati prikladnost, primjerenost i djelotvornost sustava upravljanja kvalitetom. Organizacija mora razmatrati rezultate analize i vrednovanja te izlaze preispitivanja sustava upravljanja kvalitetom kako bi se utvrdilo postoje li potrebe ili prilike s obzirom na koje mora poduzeti korake u okviru trajnog poboljšavanja“.

Ovako dani zahtjevi Norme upućuju na zaključak da one organizacije koje nemaju evidentnih nesukladnosti u sustavu upravljanja kvalitetom (što auditori provjeravaju) u potpunosti završavaju svoju misiju u kvaliteti.

Međutim, analizira li se suštinu pojma trajnog poboljšavanja kvalitete brzo će se shvatiti da se ono ne ostvaruje samo kroz ispunjenje zahtjeva norme ISO 9001:2015 nego ima mnogo širu konotaciju.

Norma ISO 9001:2015 se fokusira na pružanje povjerenja u proizvode i usluge organizacije, dok se norma ISO 9004:2018 usredotočuje na pružanje povjerenja u sposobnost organizacije da postigne **trajni uspjeh**. Upravo taj **trajni uspjeh** je rezultat trajnog poboljšavanja što bi auditori trebali utvrditi prilikom auditiranja organizacije. Da bi se to postiglo treba primijeniti metode i kriteriji dokazivanja trajnog uspjeha organizacije.

Upravo zbog nepotpunog određenja **trajnog uspjeha** putem trajnog poboljšanja u normi ISO 9001:2015 autori su pokušali u ovom radu pokazati svu složenost audita trajnog uspjeha kroz trajno poboljšavanje sustava upravljanja kvalitetom. Ta složenost zahtijeva novi pristup auditu uz korištenje dodatnih metoda i kriterija auditiranja.

2. TRAJNO POBOLJŠAVANJE NASUPROT TRAJNOG USPJEHA

Filozofija trajnog poboljšavanja jest vjerovanje da unapređivački naponi u sustavu upravljanja kvalitetom ne bi trebali nikada prestati, a da u konačnici moraju rezultirati trajnim uspjehom. Sukladno tome, svrha trajnog poboljšavanja je:¹

1. Minimiziranje troškova, smanjenjem gubitaka, svih oblika i na svim razinama (zalihe, loša kvaliteta, zastoji ...).
2. Osigurati dosljednost i/ili smanjiti varijabilnost poslovnih procesa u poduzeću.
3. Otklanjanje nedostatka poslovnih procesa u njihovom začetku ili barem bolje upravljanje tim nedostacima.
4. Timski rad – za uspjeh bilo koje metode trajnog poboljšavanja, važno je da svi sudionici rade u timovima i timski.

Prema tome, poboljšavanje je nužno da bi organizacija mogla održavati trenutačnu razinu uspješnosti, odgovarati na promjene u svojim unutarnjim i vanjskim okolnostima i stvarati nove prilike. Neke od mogućih ključnih prednosti trajnog poboljšavanja su:

- poboljšana provedba procesa, veća sposobnost organizacije i veće zadovoljstvo kupaca;
- povećana usredotočenost na istraživanje i utvrđivanje ključnih uzroka problema, nakon kojih slijede preventivne i popravne radnje;
- veća sposobnost predviđanja i reagiranja na unutarnje i vanjske rizike i prilike;
- poboljšano razmatranje postepenih i temeljitih poboljšavanja;
- bolja primjena znanja radi poboljšavanja;
- poticanje inovacija.

Svrha audita poboljšavanja, a time audita uspješnosti organizacije, je da se auditor uvjeri da se trajno poboljšava:

- prikladnost sustava upravljanja (SU) prema postavljenoj viziji,
- primjerenost SU prema postavljenoj viziji,
- djelotvornost SU prema postavljenoj viziji,
- uspješnost organizacije prema ekonomskim pokazateljima,
- da li se godišnje provodi analiza i vrednovanja SU,
- da li se razmatraju izlazi preispitivanja SU,
- da li postoje godišnji planovi poboljšanja SU.

¹ Ron Moore, *Odabir pravog alata za poboljšanje proizvodnje*, Oxford, Butterworth Heinemann, 2006. p. 416.

3. NOVE KOMPETENCIJE AUDITORA ZA DOKAZIVANJE TRAJNOG POBOLJŠAVANJA I USPJEŠNOSTI ORGANIZACIJE

Auditori trebaju poznavati metodološke pristupe dokazivanja:

- Prikladnosti SU,
- Primjerenosti SU,
- Djelotvornosti SU,
- Uspješnosti SU,
- Da se redovito SU analizira,
- Da se razmatraju i provode nalazi audita,
- Da postoje godišnji planovi poboljšavanja SU.

Otvara se pitanje kako i na koji način osigurati dokaze trajnog poboljšavanja sustava upravljanja kvalitetom. Za svaki pristup dokazivanju treba odabrati cilj i način provođenja.

Prikladnost

Cilj je: Osigurati dokaz da sustav upravljanja kvalitetom odgovara potrebi i zahtjevu organizacije.

Način: Intervju s rukovodstvom i zaposlenicima.

Primjerenost

Cilj je: Napraviti uvid u dokaze da je sustav u skladu s misijom, vizijom i politikom organizacije.

Način: Analiza misije, vizije i politike.

Djelotvornost

Cilj je: Osigurati dokaz da funkcionira sustav u kojem se ostvaruju planirane aktivnosti i postižu planirani rezultati.

Način: Analiza uspješnosti i pokazatelji zadovoljstva kupaca.

Uspješnosti

Cilj je: Osigurati dokaze o kontinuiranom napretku u poslovanju kroz: praćenje KPI, ukupnog prihoda, ukupnog rashoda, dobiti, analiza likvidnosti i solventnosti.

Način: Uvid u račun dobiti i gubitka sa usporedbom prethodnih godina.

Da se redovito analizira stanje zrelosti za kvalitetu

Cilj je: Tražiti dokaz o provedenoj samoprocjeni zrelosti za kvalitetu prema 31 kriteriju norme

ISO 9004:2018 ili drugim kriterijima, izvršenoj analizu podataka i planu mjera za poboljšavanje.

Način: Uvid u analizu podataka zrelosti i plan mjera za poboljšavanje.

Da se razmatraju i provode nalazi audita

Cilj je: Uvjeriti se da menadžment u praksi provodi nalaze audita.

Način: Tražiti izvještaj o prethodnom auditu i uvid u ostvarenje preporuka i nesukladnosti.

Utvrđiti postoje li godišnji planovi poboljšanja SU

Cilj je: Utvrđiti da li se redovito izrađuju godišnji planovi poboljšavanja SU.

Način: Napraviti uvid u planove i njihovu realizaciju.

4. ŠIRI UVID AUDITORA U NEKE SASTAVNICE SUSTAVA UPRAVLJANJA RADI PRAĆENJA USPJEŠNOSTI ORGANIZACIJE

Praćenje KPI organizacije jedno je od slabije razvijenih područja upravljanja iako je od posebne važnosti za stalno poboljšanje kvalitete organizacije.

4.1. Praćenje KPI (ključnih pokazatelja uspješnosti)

Takvi pokazatelji su potrebni da se utvrdi jesu li i koliko kvalitetno tvrtka ili njezini zaposlenici izvršili planirane zadatke. Ovi pokazatelji utječu na motivaciju zaposlenih, ako sustav uključuje njihov učinkovit poticaj.

Nameće se pitanje: Što u praćenju ključnih pokazatelja uspješnosti (KPI) auditori mogu učiniti? Auditori mogu:

- Zatražiti dokaz da su KPI određeni.
- Tražiti uvid u plan praćenja KPI s konkretnim odgovornostima u organizaciji.
- Napraviti uvid u podatke o praćenju za tekuću i prethodnu godinu.
- Uvjeriti se da se izrađuju analize rezultata praćenja KPI.
- Pogledati zapis uprave o informaciji u vezi analize KPI.
- Uvjeriti se da se poduzimaju ili ne poduzimaju određene aktivnosti za poboljšanje.

Iz prikupljenih i analiziranih podataka auditori će moći zaključiti u kojoj mjeri menadžment organizacije vidi značaj praćenja KPI i njihov doprinos ukupnoj uspješnosti organizacije.

Koncept praćenja uspješnosti organizacije se koristi kao alat u ispunjavanju strateških i taktičkih ciljeva što se auditom treba provjeriti. Tu se radi samo o onim pokazateljima koji su relevantni za postizanje planiranih ciljeva organizacije.

4.1.1. Zadovoljstva kupaca i zaposlenika

Želja za kvalitetom od strane kupca spominje se još kod Hamurabija koji je (vladao 1792. p. n. e. – 1750. p. n. e.) dakle, daleko prije nego se uveo novac kao platežno sredstvo. Očito je da je od davnina poznato da uspjeh organizacije ovisi od: kvalitete njenih proizvoda i usluga.

Suvremeni sustavi upravljanja naglašavaju potrebu praćenja i mjerenja zadovoljstva kupca kvalitetom proizvoda/usluge jer je od posebnog značaja za uspješnost poslovanja organizacije.

Novijeg je datuma praćenje zadovoljstva kupaca i zaposlenika. Uočilo se da je zadovoljstvo kupaca preduvjet za ponovnu kupnju (vraćanje kupca), a zadovoljstvo zaposlenih je veliki motivator za kvalitetniji rad. što znači kvalitetniji proizvod/uslugu, a što je krajnji cilj organizacije.

4.2. Što u praćenju zadovoljstva kupaca i zaposlenih auditori mogu učiniti?

Auditori će:

- Zatražiti dokaz da je to opredjeljenje organizacije.
- Tražiti uvid u plan praćenja s konkretnom odgovornošću.
- Napraviti uvid u podatke o praćenju za tekuću i prethodnu godinu.
- Uvjeriti se da se izrađuju analize rezultata praćenja zadovoljstva kupaca i zaposlenih.
- Pogledati zapis uprave o informaciji u vezi analize zadovoljstva kupaca i zaposlenih.
- Uvjeriti se da se poduzimaju određene aktivnosti za poboljšavanje stupnja zadovoljstva.

4.2.1. Samoprocjena zrelosti za kvalitetu osnova za poboljšavanje

Menadžment organizacije treba težiti ka održivim uspjehu organizacije koji se postiže njenom sposobnošću da zadovolji potrebe i očekivanja svojih kupaca i zaposlenika te svih zainteresiranih strana tijekom dugog vremenskog perioda i na uravnotežen način.

Iz tih razloga je norma ISO 9004:2018 dala niz smjernica za podršku organizacijama kako bi kroz stalno poboljšavanje postigle održivi uspjeh. Preporučuje se praćenje zrelosti organizacije kroz sastavnice koje ju određuju.

Tablica 1. Prikaz sastavnica SU prema ISO 9004:2018

1. Relevantne zainteresirane strane	16. Organizacijska znanja
2. Vanjska i unutarnja pitanja	17. Tehnologija
3. Misija, vizija, vrijednosti i kulture (Identitet)	18. Infrastruktura i radna okolina
4. Rukovođenje – Općenito	19. Izvana pruženi resursi
5. Politika i strategija	20. Prirodni resursi
6. Ciljevi	21. Provođenje analize i procjene organizacije – Općenito
7. Komunikacija	22. Pokazatelji učinaka
8. Upravljanje procesima – općenito	23. Analiza učinaka
9. Određenje – procesa	24. Ocjenjivanje učinkovitosti
10. Odgovornosti u procesu i autoritet	25. Interni audit
11. Upravljanje procesima (upravljanje usklađivanjem/povezivanja između procesa)	26. Samoprocjena
12. Upravljanje procesima (postizanje više razine izvođenja)	27. Pregled i izvještavanje
13. Upravljanje procesima (postizanje održive razine)	28. Poboljšanje, učenje i inovacije – Općenito
14. Upravljanje resursima – Općenito	29. Poboljšanje
15. Ljudi	30. Učenje
	31. Inovacije

Izvor: Izradili autori.

Identificiranjem slabosti i prednosti, mogućnosti poboljšavanja i inovacija norma ISO 9004:2018 preporučuje organizacijama da samoocjenjivanjem provjere razinu zrelosti organizacije. Zakonitost je da tek nakon spoznaje slabosti i prednosti organizacije možemo planirati adekvatna poboljšanja.

Put do postizanja takvih ciljeva je kontinuiran i dugoročan proces praćenja stanja zrelosti i stalnog poboljšavanja prema uvijek novo utvrđenom cilju u organizaciji.

4.3. Što su zadaće auditora?

Auditor se treba uvjeriti na što se odnosi opseg samoprocjene (model) i odnosi li se na:

- samoprocjenu ključnih elemenata SU,
- samoprocjenu detaljnih elemenata SU koje je utvrdila organizacija,
- samoprocjenu detaljnih elemenata SU, temeljenih na normi ISO 9004:2018 s dodatnim ili novim kriterijima ili razinama.

Također se treba se osvrnuti na:

- Izbor modela samoprocjene i izbor kriterija vrednovanja.
- Što izlazi iz samoprocjene pokazuju, prvenstveno:
 - snage i slabosti prema sastavnicama analize,
 - povezane rizike i prilike za poboljšavanje,
 - razinu zrelosti organizacije,
 - napredak organizacije tijekom vremena.

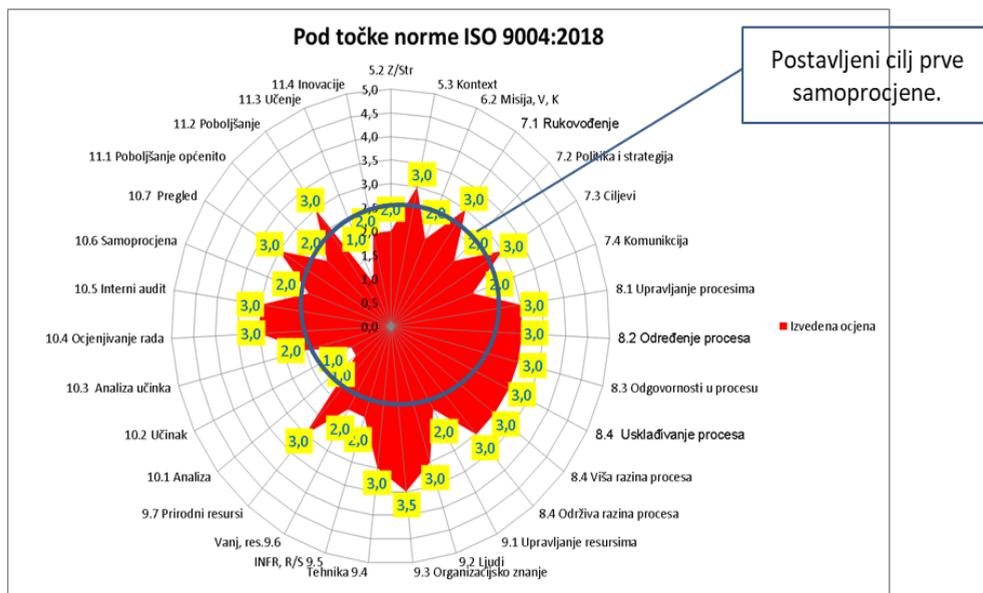
4.4. Što su izlaz iz audita samoprocjene?

Opisni izlaz iz audita samoprocjene trebaju biti istaknuti u izvještaju o auditu:

- da li se vrši samoprocjena zrelosti organizacije,
- koji model samoprocjene se koristi,
- da li uprava razmatra stanje nakon provedene svake samoprocjene,
- da li se predlažu novi ciljevi i aktivnosti koje treba postići do vremena nove samoprocjene zrelosti organizacije,
- da li su utvrđene odgovornosti za provođenje konkretnih mjera,
- zna li se kome se podnosi izvještaj o poduzetim mjerama i njihovim učincima,
- da li se prate učinci poduzetih mjera,
- da li menadžment i zaposlenici razumiju „Prošireni model sustava upravljanja kvalitetom zasnovan na procesima” – norma ISO 9004:2018.

Pored pisanog izvještaja dobro je priložiti i grafički prikaz stanja zrelosti za kvalitetu prema odabranom modelu samoprocjene.

Slika 1. Grafički prikaz izlaza iz samoprocjene (slučajni primjer)



Izvor: Izradili autori.

Budući je ovo novo područje audita SU, auditorima se nameće zahtjev za stjecanje dodatnih kompetencija.

4.4.1. Kompetencija auditora uvjet za audit samoprocjene zrelosti

Ovdje će se spomenuti što je preduvjet da auditor kvalitetno izvrši zadaće u auditu procjene zrelosti organizacije. Za te zadaće su potrebna nova znanja i sposobnosti auditora koja se sjeću dodatnom izobrazbom i treninzima. Da bi se kvalitetno izvršio audit procjene zrelosti potrebno je da auditor:

- razumije kriterije ocjenjivanja razine zrelosti,
- u pripremi za audit detaljno nauči metode samoprocjene,
- razumije razine u kriterijima vrednovanja pojedinih elemenata u samoprocjeni,
- zna kako se izvode zaključci,
- zna razloge poduzimanja mjera poboljšavanja za postizanje utvrđenih ciljeva i novih ciljeva,

- zna načine praćenja postignuća nakon poduzetih mjera poboljšavanja i
- upravlja rizicima nepristranosti.

4.4.2. Zainteresirane strane

„Zainteresirane strane² su one koje mogu utjecati ili osjetiti da su pogođene odlukom ili aktivnošću organizacije. Organizacija treba razmotriti kako uspostaviti stalne veze sa zainteresiranim stranama za prednosti kao što su poboljšana učinkovitost, zajedničko razumijevanje ciljeva i vrijednosti te poboljšanu stabilnost.

Kvaliteta organizacije se poboljšava, a kontinuirani uspjeh se može postići dosljedno ispunjavajući potrebe i očekivanja njenih zainteresiranih strana na dugi rok“. Auditor se treba uvjeriti da li je ocijenjeno što za zainteresirane strane:

- predstavlja rizik za kontinuirani uspjeh,
- pruža prilike za poboljšavanje i
- znači uspostavljanje stalne veze organizacije s njima.

Slika 2. Prikaz uobičajenih zainteresiranih strana



Izvor: Norma ISO 9004:2018.

² Norma ISO 9004:2018

4.4.3. Vanjska i unutarnja pitanja

Vanjska i unutarnja pitanja su čimbenici (faktori) koji postoje izvan organizacije ili u samoj organizaciji, a koji mogu utjecati na sposobnost organizacije u postizanja trajnog uspjeha. Slijedom toga organizacija treba odrediti koja vanjska i unutarnja pitanja mogu rezultirati rizicima za njen kontinuirani uspjeh ili prilika za poboljšavanje njenog kontinuiranog uspjeha. Auditor se treba uvjeriti da li samoprocjena obuhvaća odgovore na:

1. Vanjska pitanja koja obuhvaćaju:

- zakonske i regulatorne zahtjeve,
- posebne zahtjeve i sporazume u sektoru,
- natjecanje,
- globalizaciju,
- društvene, gospodarske, političke i kulturne čimbenike,
- inovacije i napredak u tehnologiji,
- prirodni okoliš.

2. Unutarnja pitanja koja obuhvaćaju:

- veličinu i složenost organizacije,
- aktivnosti i pridružene procese,
- strategiju,
- vrstu proizvoda i usluga,
- izvedbu,
- resurse,
- razine kompetencija i organizacijska znanja,
- zrelost,
- inovacije.

4.4.4. Upravljanje procesima

„Organizacije daju vrijednost³ kroz aktivnosti povezane unutar mreže procesa. Procesi često prelaze granice funkcija unutar organizacije. Dosljedni i predvidljivi rezultati su učinkovitiji kada mreža procesa funkcionira kao koherentni sustav. Procesi su specifični za organizaciju i ovise o vrsti, veličini i razini zrelosti organizacija“. Auditor će tražiti dokaze da li je u samoprocjeni utvrđeno da:

- je uspostavljena mreža procesa s međusobnim ovisnostima, ograničenjima i zajedničkim resursima tako da funkcionira kao koherentni sustav,

3

Ibid.

- su određene aktivnosti unutar svakog procesa i rizici na njima,
- je osigurano da se procesi upravljaju proaktivno, uključujući i vanjske procese,
- je optimizirana ravnoteža između različitih svrha i specifičnih ciljeva procesa.

Također se auditor uvjerava da se/su:

- upravlja procesima i njihovim interakcijama,
- koristi vizualizirana mreža procesa i interakcije – grafički,
- određuju kriteriji za izlaze procesa, i ocjenu sposobnosti i performanse procesa,
- proaktivno procjenjuju rizici i prilike povezane s procesima kao što su:
 - ljudski čimbenici neodgovarajuće mogućnosti, pogoršanja i kvarovi opreme,
 - neuspjeh dizajna i razvoja,
 - neplanirane promjene dolaznih materijala i usluga,
 - nekontrolirane promjene u okolišu za rad procesa,
 - neočekivane promjene u potrebama i očekivanjima zainteresiranih strana,
 - redovit pregled procesa i njihovih međusobnih odnosa.
- u procesima uvažavaju aspekti:
 - kvalitete proizvoda i usluga, uključujući troškove, količinu i isporuku,
 - zdravlja i sigurnosti,
 - okoliša i energije,
 - društvene odgovornosti, anti-korupcije,
 - kontinuiteta poslovanja i elastičnosti.
- u procima razmatra:
 - svrha procesa,
 - ciljeva koje treba postići i s njima povezane pokazatelje uspješnosti,
 - izlaze koji se trebaju dostaviti,
 - potrebe i očekivanja zainteresiranih strana i njihove promjene,
 - promjene u poslovanju, tržištima i tehnologijama,
 - utjecaje procesa,
 - potrebne ulaze, resurse i informacije i njihovu dostupnost,
 - aktivnosti koje treba provesti i metode koje se mogu koristiti,

- ograničenja za proces i
- rizike i prilike.
- u procesima:
 - imenovane odgovorne osobe (posebno “Vlasnik procesa”),
 - osigurani zahtjevi da su odgovornosti, ovlasti i uloge vlasnika procesa prepoznate tijekom cijele poslovne godine,
 - osigurane kompetencije ljudi potrebne za izvršenje zadataka i aktivnosti.
- da su:
 - procesi pod kontrolom,
 - određene kontrolne točke i
 - uspostavljene kontrole primjene postupaka u njima.

Isti i/ili slični metodološki postupci primjenjuj se i na ostale sastavnice SU danim u Prikazu sastavnica SU prema ISO 9004:2018, koje nisu ovdje posebno obrazlagani.

5. ZAKLJUČAK

Ovaj metodološki model audita procesa trajnog poboljšavanja SU može poslužiti svim organizacijama kao smjernica dokazivanja učinaka poboljšavanja koji vodi do trajnog uspjeha organizacije.

Klasični pristup auditu poboljšavanja zatvara organizaciju u okviru ispunjenja zahtjeva norme ISO 9001:2015 i sužava svrhu procesa kontinuiranog poboljšavanja koji ima široke konotacije. Trajni uspjeh organizacije treba biti rezultat procesa trajnog poboljšavanja što bi auditori trebali utvrditi prilikom auditiranja organizacije, a njihov izvještaj ukazati na stanje i puteve ka trajnom uspjehu. Da bi se to postiglo treba primijeniti suvremene metode i kriteriji dokazivanja trajnog uspjeha organizacije.

Svako odmicanje od prihvaćanja novih načina auditiranja procesa trajnog poboljšavanja može dovesti do samozadovoljstva u vezi razine zrelosti organizacije za kvalitetu.

Abstract:**AUDIT OF THE PROCESS OF
CONTINUOUS IMPROVEMENT OF THE ORGANIZATION**

Continuous improvement of the quality management system should lead to an increase in the level of maturity of the quality organization. This goes beyond meeting the requirements of ISO 9001: 2015. so it is necessary to establish new guidelines that can determine the lasting success of the organization as a result of continuous improvement. In other words, other parameters should be included in the quality management system that allows measuring the lasting success of the organization at all times. ISO 9004: 2018 standard. has set guidelines for building confidence in an organization's ability to achieve lasting success. Of course, in addition to these guidelines, the audit of the improvement process should include economic indicators that prove whether the organization achieves continuous success through the improvement process. In order to audit the process of continuous improvement to determine the compliance of the state of maturity with the new requirements identified in the process, it is necessary to have a new methodological approach to such an audit. For these reasons, the paper presents a possible methodological approach to the audit of the process of continuous improvement, which aims to encourage all those involved in quality management to contribute to improving the methodology of the audit of the process of continuous improvement of the organization. The authors of this paper are convinced that this paper opens new dimensions in the audit of the process of continuous improvement, and special benefit will be to organizations for conducting internal audit, which must be in the function of growth and development of the organization.

Key words: audit of continuous improvement, the level of maturity of the organization, lasting success of the organization.

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METODOLOGIJA MJERENJA DRUŠTVENE ODGOVORNOSTI PODUZEĆA

METHODOLOGY FOR MEASURING CORPORATE SOCIAL RESPONSIBILITIES

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SAŽETAK

U radu se obrađuje društvena odgovornost poduzeća u Republici Hrvatskoj. Društvena odgovornost podrazumijeva dobrovoljan angažman poduzeća u pogledu brige za društvene i ekološke interese, odnosno interese koji nadilaze isključivo ekonomsku dimenziju u poslovanju poduzeća. Interes za ovom temom proizlazi iz činjenice da uspješnost poslovanja poduzeća ovisi o kvaliteti odnosa koje poduzeće gradi s unutarnjom i vanjskom okolinom. Stupanj zadovoljstva svih dionika se reflektira na ekonomsku i tržišnu poziciju poduzeća kao i na kvalitetu života u široj zajednici. Hrvatska gospodarska komora razvila je metodologiju za mjerenje indeksa druš-

tveno odgovornog poslovanja u Republici Hrvatskoj na temelju kriterija ekonomske održivosti, društveno odgovornih politika u poslovnim strategijama, zaštite okoliša, radne okoline, kvalitete i sigurnosti rada, društveno odgovornih tržišnih odnosa i odnosa sa zajednicom te poštovanja raznolikosti i zaštite ljudskih prava. Na ovaj se način promiče kontinuirani razvoj društveno odgovornog poslovanja u hrvatskoj gospodarskoj praksi.

Ključne riječi: društvena odgovornost, održivi razvoj, metodologija mjerenja društvene odgovornosti.

1. ODRŽIVI RAZVOJ KAO IZVORIŠTE ZA PROMIŠLJANJE O DRUŠTVENOJ ODGOVORNOSTI PODUZEĆA

Pojam razvoj se tradicionalno poimao kao ekonomski koncept i odnosio se na sposobnost stvaranja nove vrijednosti na mikro, mezo ili makro razini u određenoj nacionalnoj ekonomiji. Važnost razvoja kao isključive ekonomske kategorije počela se posebno analizirati u razdoblju industrijalizacije proizvodnje kad je tehnološki napredak omogućio stvaranje veće količine viškova u procesu proizvodnje te se proizvodni kapacitet pojedinih industrijskih pogona širio i kontinuirano razvijao. Isključiva orijentacija na osiguranje gospodarskog rasta i razvoja dovela je do značajnog problema jer počiva na uskogrudnom poimanju rasta i razvoja u kojem su svi društveni i ekološki čimbenici podređeni ekonomskim parametrima ili parametrima profita. Takav pristup je rezultirao eksploatacijskim odnosom prema okolišu i čovjeku, čime je narušena ravnoteža o kojoj ovisi kvaliteta života cjelokupnog stanovništva.¹

Održivi razvoj jest koncept koji je usko vezan uz pitanje etičnog pristupa svim resursima putem kojih se generira nova vrijednost, uz pitanje intergeneracijske pravde. To je vidljivo iz definicije održivog razvoja koja glasi da je to „onaj razvoj koji zadovoljava sadašnje potrebe, ne ugrožavajući mogućnosti budućih generacija da zadovolje svoje potrebe.“² Kako bi se zadovoljili etički zahtjevi i zahtjevi vezani uz intergeneracijsku pravdu, u središtu

¹ Ivan Cifrić, „Održivi razvoj i strategija zaštite okoliša“, *Socijalna ekologija*, časopis za ekološku misao i sociologijska istraživanja okoline, Vol. 9, No. 3, Zagreb, 2000, str. 233-248.

² Drago Pupavac, „Održivi razvoj – ograničenje ili izazov gospodarskom rastu“, Zbornik radova *Održivi razvoj ruralnih krajeva*, Veleučilište Nikola Tesla u Gospiću, Gospić, 2014, str. 133-136.

koncepta održivog razvoja su tri temeljna cilja: ekonomska učinkovitost, socijalna odgovornost i ekološka održivost.³

Održivi razvoj je holistički koncept kojem je cilj uravnoteženo doprinijeti ostvarivanju navedenih ciljeva koji su naizgled proturječni. U cilju ostvarivanja ekonomske učinkovitosti, nužno je inovirati procese proizvodnje i pružanja usluga kako bi bili energetski učinkovitiji i u što manjoj mjeri utjecali na onečišćenje i zagađenje okoliša. Uz razvoj tehnološki proizvodnih kapaciteta i rastuće inovacijske sposobnosti tvrtki, navedeni cilj postaje izvediv i jedan je od temelja u postizanju dugoročne održive konkurentnosti suvremenih poduzeća.

Održivi razvoj, uz uvažavanje ekološke i ekonomske ravnoteže, uvodi i treću varijablu, a to je društvena ili socijalna pravednost. Ukoliko se ekonomski procesi proizvodnje i pružanja usluga sagledaju u širem kontekstu, oni zapravo nisu sami sebi svrha niti im je jedina svrha stvaranje profita, već utjecati na povećanje kvalitete života ljudi u zajednici. Uz ostvarenje društvene pravednosti putem održivog razvoja se vezuje i ideja „kapitalizma s ljudskim licem“ u kojem se ekonomski ciljevi realiziraju istodobno s ključnim društvenim ciljevima, a to su smanjenje stope siromaštva, rizika od siromaštva i socijalne isključenosti, inkluzija osjetljivih društvenih skupina u sustav obrazovanja i rada i, općenito, briga o svim društvenim skupinama i njihovim potrebama u cilju razvoja društva utemeljenog na empatiji.⁴

Koncept održivog razvoja utemeljen na uravnoteženom pristupu ostvarenju ekonomskih, ekoloških i društvenih ciljeva razvija se na globalnoj razini i predstavlja svojevrsnu inspiraciju i temeljni okvir unutar kojeg se razvija koncept društvene odgovornosti poduzeća.

2. DRUŠTVENA ODGOVORNOST PODUZEĆA

Koncept društvene odgovornosti poduzeća počinje se razvijati od 1960-ih godina kao odraz razvoja svijesti da poduzeća ne posluju u izoliranom i hermetičnom okruženju, već su dio šire društvene zajednice. Stoga se

³ Jose Manuel Diaz-Sarachaga, Daniel Jato-Espino, Daniel Castro-Fresno, „Is the Sustainable Development Goals (SDG) index an adequate framework to measure the progress of the 2030 Agenda?“, *Sustainable Development*, Vol. 26, No. 6, John Wiley&Sons. Inc., New York City, United States, pp. 663-671.

⁴ Lorena Korošec, Dora Jurdana Smolčić, „Politika zaštite okoliša-integralni dio koncepcije održivog razvitka Europske unije“, *Ekonomski pregled*, Vol. 64, No. 6, Zagreb, 2013, str. 605-629.

uloga poduzeća ne smije poimati isključivo s ekonomskog, već socio-ekonomskog i ekološkog stajališta, u skladu s konceptom održivog razvoja.

Društvena odgovornost poduzeća jest koncept koji prepoznaje da jednodimenzionalno postavljenje ciljeva poduzeća u kojem se naglašava profit „pod svaku cijenu“ dovodi do dugoročnog narušavanja odnosa ravnoteže između poduzeća i okruženja u kojem posluje. Takav pristup je konfliktan i ne uzima u obzir potrebe različitih dionika u unutarnjoj i vanjskoj okolini poduzeća, što u konačnici otežava nesmetani rast i razvoj poduzeća. Poduzeća sve više razvijaju i implementiraju strategije društvene odgovornosti kako bi se uspješno nosila s izazovima u dinamičnom okruženju, i kako bi postigla uravnoteženi odnos između ekonomskih, društvenih i ekoloških ciljeva u poslovanju. Na ovaj način, svako poduzeće postaje partner i aktivan sudionik u razvoju zajednice u kojoj posluje i stječe povjerenje i pozitivnu reputaciju u toj istoj zajednici.⁵

Na temelju prethodno navedenog, društvena odgovornost poduzeća se može definirati kao „koncept prema kojem poduzeća na dobrovoljnom principu integriraju brigu za društvena pitanja i zaštitu okoliša u svoje poslovne aktivnosti i odnose s vlasnicima, dioničarima, zaposlenicima, potrošačima, dobavljačima, vladom, medijima i širom javnošću.“⁶

Društvena odgovornost u poslovanju poduzeća pokazuje da etičan odnos kojem je cilj uspostaviti ravnotežu ekonomskih, socijalnih i ekoloških ciljeva treba razvijati u svim aspektima poslovanja poduzeća. Usvajanje koncepta društvene odgovornosti u poslovanju poduzeća, zapravo znači revidiranje kriterija na temelju kojih se donose strateške, taktičke i operativne poslovne odluke. Poslovno odlučivanje se na svim hijerarhijskim razinama treba temeljiti na setu jasnih i objektivnih kriterija. Kod poduzeća koja nisu razvila društveno odgovorno poslovanje, kriteriji za donošenje odluka su u velikoj mjeri egoistični, fokusirani isključivo na profit, i to često pod svaku cijenu.

S druge strane, društveno odgovorna poduzeća imaju zadaću analize utjecaja pojedinih poslovnih odluka na ekonomske aspekte poslovanja, ali i društvene te ekološke čimbenike kao i na različite dionike u unutarnjem i vanjskom okruženju poduzeća. Složenost procesa donošenja odluka u društveno odgovornim poduzećima iznimno je naglašena, ali je navedeni pristup izuzetno koristan jer podrazumijeva holističko poimanje posljedica svake poslovne odluke, čime se značajno povećava kvaliteta procesa poslovnog odlučivanja.

⁵ Damir Grgić, „Teorijski okviri reputacije poduzeća“, *Ekonomski pregled*, Vol. 59, No. 5-6, Zagreb, 2008, str. 266-288.

⁶ Martina Srblićinović, „Utjecaj društvene odgovornosti poduzeća na ponašanje potrošača u Hrvatskoj“, *Zbornik ekonomskog fakulteta u Zagrebu*, Vol. 10, No. 2, Zagreb, 2012, str. 161-180.

Istinska društvena odgovornost poduzeća nastaje kad „menadžeri razvijaju procese odlučivanja gdje se anticipiraju reakcije okruženja i uvažavaju socijalne i društvene vrijednosti (proaktivno djelovanje).“⁷ Jedino kroz proaktivno djelovanje i promišljanje o uravnoteženom odnosu između ekonomskih, socijalnih i ekoloških ciljeva podrazumijeva holistički pristup društveno odgovornom poslovanju kojem je cilj istinska dobrobit poduzeća i svih dionika u okolini poduzeća.

Davis u modelu korporativne društvene odgovornosti ističe pet pretpostavki koje poduzeće treba ispuniti prilikom implementacije koncepta društveno odgovornog poslovanja:⁸

- društvena odgovornost proizlazi iz društvene moći,
- tvrtke moraju poslovati kao dvostrani otvoreni sustavi, s otvorenim primanjem informacija od društva i otvorenim prikazom vlastitih aktivnosti javnosti,
- moraju se pomno promotriti i izračunati troškovi i prinosi aktivnosti, proizvoda ili usluge u odlučivanju o njihovom nastavku proizvodnje,
- društveni troškovi povezani sa svakom aktivnosti, proizvodom ili uslugom prenose se na klijente,
- poslovne institucije, kao građani, imaju odgovornost da se uključe u određene društvene probleme koji su izvan njihovog uobičajenog područja djelovanja.

Razina društvene odgovornosti poduzeća treba biti proporcionalna društvenom statusu i mogućnosti utjecaja na zajednicu kojom poduzeće raspolaže. Transparentnost je važan aspekt društvene odgovornosti; odnosi na otvorenu, točnu, iskrenu i ažurnu komunikaciju između poduzeća i zainteresiranih skupina dionika. U društveno odgovornom poslovanju potrebno je mjeriti odnose prinosa i troška po svakoj aktivnosti, proizvodu ili usluzi te ih prenijeti na korisnike. Proaktivno djelovanje na razini zajednice zadaća je svakog društveno odgovornog poduzeća s obzirom na činjenicu da poduzeće posluje u zajednici i njezin je dio te se stoga ne smije izolirati pred određenim društvenim problemima koje zajednica treba rješavati ujedinjeno i na suradnički način.

⁷ Adil Kurtić, „Društvena odgovornost – Novi svjetski pokret i poslovni imperativ savremenog menadžmenta,“ *Tranzicija*, Ekonomski institut Tuzla, Vol. 11, No. 23-24, JCEA Zagreb, DAEB, IEP Beograda, feam Bukurest, Tuzla, 2009, str. 90-100.

⁸ Keith Davis, Model of Corporate Social Responsibility. Dostupno na: <https://managementinnovations.wordpress.com/2008/12/06/keith-davis-model-of-corporate-social-responsibility/> (pristupljeno 20.9.2021.).

Koje su temeljne razlike u razini odgovornosti kod poduzeća koja primjenjuju ekonomski i socio-ekonomski ili društveno odgovoran koncept u poslovanju? U ekonomskom ili *stockholder* modelu se donošenje odluka zasniva na maksimizaciji profita kao jedinom i isključivom cilju poslovanja poduzeća.⁹ Upravo zbog navedene orijentacije, u poduzeću je odnos prema resursima eksploatacijski, a isključivi parametar uspjeha je ekonomski povrat na uložene resurse. Poduzeće posluje imajući na umu isključivo individualne resurse, a mehanizmi društvene kontrole i uloga države su minimalni.

Socio-ekonomski model usmjeren je na kvalitetu života, održivi pristup resursima, uravnoteženi povrat investicija koji osim ekonomske uvažava i socijalnu te ekološku dimenziju. Poduzeće djeluje imajući na umu zajedničke interese različitih interesno-utjecajnih skupina ili dionika u njegovom poslovanju.

3. INDEKSI ZA MJERENJE DRUŠTVENE ODGOVORNOSTI PODUZEĆA

Sve veća važnost društveno odgovornog poslovanja u globalnom poslovnom okruženju, nametnula je potrebu za razvojem sveobuhvatnih i učinkovitih metodologija mjerenja uspješnosti primjene koncepta društveno odgovornog poslovanja u poduzećima. Tako se na međunarodnoj razini razvio niz indeksa za mjerenje učinka primjene koncepta društvene odgovornosti. Postupno su i agencije za kreditni rejting počele uvrštavati ekološku i društvenu dimenziju poslovanja u izvještaje o uspješnosti poslovanja korporacija. U Republici Hrvatskoj je također razvijen indeks društveno odgovornog poslovanja za mala, srednja i velika poduzeća te javna poduzeća. HGK i HR PSOR (Poslovni savjet za održivi razvoj) zajednički dodjeljuju nagradu za društveno odgovorno poslovanje najuspješnijim poduzećima.¹⁰

⁹ Aida Bagić, Marina Škrabalo, Lana Narančić, *Pregled društvene odgovornosti poduzeća u Hrvatskoj*, AED, - Zagreb, 2006, str. 12.

¹⁰ Indeks DOP-a u Hrvatskoj nastao kao rezultat partnerskog projekta HR PSOR-a (Hrvatski poslovni savjet za održivi razvoj) i HGK (Hrvatska gospodarska komora), a u njegovu razvoju veći je doprinos HR PSOR-a, a kroz godine je njegova uloga samo rasla. No, nigdje nije rađena procjena doprinosa. Prema sporazumu o suradnji između HGK i HR PSOR stoji da svaki od partnera u svakom trenutku mora komunicirati i participaciju onog drugog. Ukoliko bi se u komunikaciji spomenuo samo jedan od partnera, namjerno ili nenamjerno, bilo bi to kršenje odredbi sporazuma.

3.1. Razvoj indeksa za mjerenje uspješnosti društveno odgovornog poslovanja u svijetu

Prvi indeksi o društveno odgovornom poslovanju razvijeni su u Sjedinjenim Američkim Državama. Prvi indeks društveno odgovornog poslovanja bio je Dow Jones indeks koji je razvijen u rujnu 1999. pod nazivom SI (*eng. sustainability index*) ili indeks održivosti poslovanja. Godinu dana kasnije Calvert fond je počeo objavljivati CSR indeks (*eng. CSR – Corporate Sustainability Index*) ili indeks društvene odgovornosti, dok je britanska konzultantska kuća FTSE razvila indeks za mjerenje društvene odgovornosti poduzeća pod nazivom FTSE4Good u srpnju 2001. godine.¹¹

Razvoj navedenih indeksa zainteresirao je brojne poslovne subjekte za ekološku i društvenu dimenziju poslovanja te su brojna poduzeća postala dodatno motivirana za postizanje uspješnih rezultata u uspostavi ravnoteže između ekonomskih, ekoloških i društvenih ciljeva u poslovanju.

3.1.1. Indeks održivosti Dow Jones

Temeljni kriteriji koji se razmatraju prilikom odabira najuspješnijih korporacija sukladno *Dow Jones* indeksu održivosti je analiza triju aspekata poslovanja: gospodarstva, zaštite okoliša i društvene odgovornosti.

Dow Jones Sustainability World Index, odnosno DJSI World, globalni je indeks u čiji je izračun uključeno 10% od najvećih 2.500 korporacija u S&P globalnom tržišnom indeksu na temelju njihove održivosti i ekoloških praksi. Indeks kreira S&P u suradnji s RobecoSAM-om, stručnjakom za ulaganja sa sjedištem u Zürichu koji svake godine provodi detaljna istraživanja održivosti na tisućama globalnih lidera. Indeks se izračunava na globalnoj razini, ali i za posebne regije kao što su Sjeverna Amerika, Europa, Azija i Pacifik, Koreja, Australija, Čile i tržišta u nastajanju.¹²

¹¹ CSR indices worldwide. Dostupno na: http://www.respectindex.pl/csr_indices_worldwide, (pristupljeno 16.9.2021.).

¹² Dow Jones Sustainability Index. Dostupno na: <https://www.investopedia.com/terms/d/djones-sustainability-world.asp#:~:text=The%20Dow%20Jones%20Sustainability%20World%20Index%20or%20DJSI,Index%20based%20on%20their%20sustainability%20and%20environmental%20practices>, (pristupljeno 9.9.2021.).

3.1.2. Calvertov društveni indeks

Calvertov društveni indeks izračunava se od 2000. godine. U izračun indeksa uključena je analiza ekonomskih parametara poduzeća koja primjenjuju društveno odgovorno poslovanje. Poduzeća kod kojih se izračunava indeks biraju se na osnovu proizvodno-uslužnog asortimana, brige o zaštiti okoliša (zaštita i onečišćenje), brige o usklađenosti uvjeta rada s pravilima i etičkim standardima i na temelju poslovnog integriteta.

Calvert indeks društveno odgovornog poslovanja jest burzovni indeks koji je stvorilo poduzeće *CalvertInvestments* kao mjerilo uspješnosti poslovanja velikih tvrtki koje se smatraju društveno odgovornima ili etičnim. U izračun indeksa ulaze rezultati poslovanja 680 poduzeća. Poduzeća su odabrana između približno 1.000 najvećih korporacija u Sjedinjenim Državama koje koriste *Calvertove* kriterije društveno odgovornog poslovanja. Ti se kriteriji odnose na okoliš, pitanja zadovoljstva i uvjeta rada na radnom mjestu, sigurnost proizvoda, odnose sa zajednicom, međunarodne operacije i zaštitu ljudska prava.¹³

3.1.3. Indeks FTSE4Good

FTSE4Good Indeks za mjerenje društvene odgovornosti su pokrenuli Londonska burza i Financial Times u srpnju 2001. godine. Trenutno se indeksi izračunavaju za cijeli svijet, za odabrana tržišta i za odabrane regije. Poduzeća koja su uključena u indeks prolaze negativnu selekciju jer su isključena poduzeća koja se bave proizvodnjom oružja, proizvodnjom štetnih tvari ili krše načela društvene jednakosti, kao i pozitivnu selekciju u vidu aktivnosti zaštite okoliša, razvoja pozitivnih odnosa s okolišem, održavanja i razvoj ljudskih prava i borbe protiv korupcije. Ovi indeksi su jedini priznati indeksi mjerenja društveno odgovornog poslovanja koji su priznati od strane UNICEF-a.¹⁴

¹³ CalvertSocial Index Class A. Dostupno na: <https://www6.voyaretirementplans.com/custom/1007.pdf>, (pristupljeno 12.9.2021.).

¹⁴ FTSE4Good Index Series. Dostupno na: <https://www.ftserussell.com/products/indices/ftse4good>, (pristupljeno 13.9.2021.).

3.2. Indeks mjerenja društveno odgovornog poslovanja u Republici Hrvatskoj

Hrvatska gospodarska komora je razvila indeks društveno odgovornog poslovanja kojim se evaluiraju društveno odgovorne prakse prisutne u poslovanju hrvatskih poduzeća. Metodologija se razvila sukladno primjerima dobre prakse u međunarodnom okruženju, s posebnim naglaskom na *Business in the Community CR Index*.¹⁵

Na osnovu izračuna ovog indeksa, HGK ujedno dodjeljuje nagrade poduzećima koja imaju najrazvijenije prakse društveno odgovornog poslovanja na području Republike Hrvatske. Kriteriji za ocjenjivanje društvene odgovornosti poduzeća podijeljeni su u sedam temeljnih kriterija, i to: „ekonomska održivost, uključenost društveno odgovornog poslovanja u poslovnu strategiju, radna okolina, zaštita okoliša, tržišni odnosi, odnosi sa zajednicom i odgovorne politike raznolikosti i zaštite ljudskih prava.“¹⁶

Instrumenti za prikupljanje podataka o društveno odgovornom poslovanju su strukturirani anketni upitnici koji su podijeljeni s obzirom na veličinu poduzeća (mikro i mala poduzeća, srednja i velika poduzeća te javna poduzeća). Upitnici za poduzeća svih veličina slijede kriterije za utvrđivanje razine društveno odgovornog poslovanja u pogledu ekonomskih, društvenih i ekoloških aspekata poslovanja.

Sadržaj upitnika za mjerenje društvene odgovornosti u Republici Hrvatskoj nije važan samo u smislu nagrađivanja poduzeća za usvajanje društveno odgovornih politika u poslovanju, već se upitnik može koristiti i kao sustav smjernica i uputa za praktičnu implementaciju društveno odgovornih praksi u poduzeću kroz sedam aspekata: ekonomska odgovornost, implementacija društvene odgovornosti u poslovnu strategiju, radna okolina, odnos prema okolišu, kvaliteta i sigurnost rada, društvena odgovornost u tržišnim odnosima kao i u odnosima prema zajednici te nediskriminacija i zaštita ljudskih prava.

Na ovaj je način stvoren sistematičan i praktičan okvir za cjelovito usvajanje društveno odgovornog poslovanja kao višedimenzionalnog i složenog koncepta. Smjernicama iz predstavljenih upitnika osigurava se jasno shvaćanje opsega ovog koncepta koji se često primjenjuje tek djelomično i fragmentirano. Sama uspostava navedenih upitnika odnosno smjernica omogućava značajan iskorak u uspostavi društveno odgovornih poslovnih praksi poduzeća koja posluju u Republici Hrvatskoj.

¹⁵ Hrvatska gospodarska komora. Indeks DOP-a HGK i HRPSOR-a. Dostupno na: <https://dop.hgk.hr/>, (pristupljeno 15.9.2021.).

¹⁶ Hrvatska gospodarska komora. Indeks DOP-a HGK i HRPSOR-a. Dostupno na: <https://dop.hgk.hr/>, (pristupljeno 15.9.2021.).

4. ZAKLJUČAK

Društveno odgovorno poslovanje je koncept koji je usko vezan i proizlazi iz održivog razvoja ili razvoja kojem je cilj očuvati ključne resurse za buduće generacije, uspostavom uravnoteženih odnosa između gospodarskih, socijalnih i ekoloških ciljeva. Društvena odgovornost se često ilustrira putem piramidalnog prikaza u kojem je ekonomska odgovornost ili težnja za maksimizacijom profita najniža razina odgovornosti poduzeća; potom slijedi odgovornost na pravnoj razini te etička i diskrecijska ili filantropska odgovornost.

Razvoj društveno odgovornih praksi u poslovanju nije zamisliv bez usvajanja načela poslovne etike jer je prilikom donošenja poslovnih odluka potrebno uzeti u obzir utjecaj na sve ključne dionike: zaposlenike, kupce, vlasnike, dioničari, dobavljače i širu javnost. Strategija društvene odgovornosti ovisi o stupnju do kojeg poduzeće uvažava utjecaj vlastitog poslovanja na ključne dionike. Poduzeća koja nisu implementirala društveno odgovorno poslovanje primjenjuju opstruktivnu i defenzivnu strategiju, dok će se poduzeća s višim stupnjem društvene odgovornosti koristiti adaptivnom i proaktivnom strategijom.

Metodologija mjerenja društvene odgovornosti poduzeća počela se razvijati na međunarodnoj razini te je razvijen niz indeksa, kao što su DJSI indeks, Calvertov indeks društvene odgovornosti te FTSE4Good indeks. U Republici Hrvatskoj su HR PSOR i HGK, zajedno razvili metodologiju za mjerenje indeksa društvene odgovornosti na temelju ekonomske održivosti, radne okoline, kvalitete i sigurnosti rada, zaštite okoliša, društvenih odnosa s tržišnim dionicima i zajednicom te na temelju odgovornosti prema raznolikosti i zaštiti ljudskih prava.

Prve inicijative za razvojem društvene odgovornosti u Republici Hrvatskoj počele su se razvijati 2004. godine te se postupno razvila Nacionalna mreža za društveno odgovorno poslovanje u kojoj su okupljeni predstavnici privatnog, javnog i civilnog sektora kao i akademska zajednica. Od 2008. godine, HGK i HR PSOR nagrađuju društveno odgovorna poduzeća. Nagrade se dodjeljuju malim, srednjim i velikim poduzećima te poduzećima koja su postigla najveći napredak u pogledu implementacije društveno odgovornih politika i praksi u poslovanju. Interes za ovim priznanjem kontinuirano raste što ukazuje na postupan rast svijesti o društvenom odgovornom poslovanju među poduzećima u Republici Hrvatskoj.

Abstract

METHODOLOGY FOR MEASURING CORPORATE SOCIAL RESPONSIBILITIES

The paper deals with the social responsibility of companies in the Republic of Croatia. Social responsibility implies voluntary engagement of companies in caring for social and environmental interests, i.e. interests that go beyond only the economic dimension in the business of the enterprise. Interest in this theme stems from the fact that the performance of the company's business depends on the quality of the relationship that the company creates with the internal and external environment. The level of satisfaction of all stakeholders reflects on the economic and market position of the company as well as on the quality of life in the wider community. The Croatian Chamber of Economy has developed a methodology for measuring the index of corporate social responsibility in the Republic of Croatia. The index was established based on economic sustainability, socially responsible policies in business strategies, environmental protection, working environment, quality and safety of work, socially responsible market relations and relations with the community, and respect for diversity and protection of human rights. The continuous development of corporate social responsibility in Croatian economic practice is promoted through this initiative.

Key words: social responsibility, sustainable development, methodology for measuring social responsibility.

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Tematska cjelina/*Thematic unit*
KVALITETA U PROIZVODNJI, GRAĐEVINARSTVU
I POLJOPRIVREDI
*QUALITY IN MANUFACTURING, CONSTRUCTION
AND AGRICULTURE*

Poreč, Hrvatska/*Croatia*
16. – 18. ožujka 2022.
March 16th – 18th, 2022

**POSTOJI LI VEZA IZMEĐU
SUSTAVA UPRAVLJANJA KVALITETOM ISO 9001
I POKAZATELJA PROFITABILNOSTI
U PRERAĐIVAČKOJ INDUSTRIJI?**

IS THERE A LINK BETWEEN THE ISO 9001
QUALITY MANAGEMENT SYSTEM AND
PROFITABILITY INDICATORS IN THE MANUFACTURING
INDUSTRY?

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SAŽETAK

Kvaliteta proizvoda jedan je od glavnih kriterija stjecanja kompetitivnih prednosti u odnosu na konkurenciju. S druge strane često se upućuju kritike kako kvalitetu nije moguće mjeriti, odnosno njene učinke na profitabilnost poslovanja. Upravljanje kvalitetom je dio upravljanja kojim se ostvaruju ciljevi kvalitete kroz planiranje, praćenje, osiguravanje i poboljšavanje kvalitete. Prerađivačka industrija u RH predstavlja jedan bitan segment hrvatskog gospodarstva, a jedna od njenih karakteristika je niža konkurentnost u odnosu na druge zemlje te potreba za konkurentnošću i inovacijske sposobnosti kao odgovor na sve jaču konkurenciju i proces globalizacije. U ovom radu provedeno je istraživanje u koje je uključeno 200 najvećih poduzeća u prerađivačkoj industriji te su analizirani njihovi pokazatelji profitabilnosti. Uz njih dodatno je uključeno 21 poduzeće iz prerađivačke industrije koja su uvela sustav upravljanja kvalitetom ISO 9001. Usporedbom svih poduzeća i njihovih po-

kazatelja došlo se do određenih zaključaka koji idu u smjeru kako poduzeća koja su uvela sustav upravljanja kvalitetom ISO 9001 imaju bolje pokazatelje profitabilnosti u odnosu na 200 najvećih iz grane prerađivačke industrije.

Ključne riječi: kvaliteta, sustav upravljanja kvalitetom, ISO 9001, prerađivačka industrija

1. UVOD

Kvaliteta proizvoda jedan je od glavnih kriterija stjecanja kompetitivnih prednosti u odnosu na konkurenciju. Više istraživanja provedenih među potencijalnim kupcima je pokazalo kako su ispitanici spremni platiti više za proizvod koji im nudi veću kvalitetu.

U prerađivačkoj industriji¹ Republike Hrvatske dugoročno su prisutne negativne tendencije: smanjuje se njen doprinos ukupnom outputu gospodarstva, od ukupnog gubitka radnih mjesta najviše ih je izgubljeno upravo u prerađivačkoj industriji, izvoz ne raste zadovoljavajućom dinamikom, investicije su nedostatne za značajnije pokretanje gospodarskog ciklusa, konkurentnost prerađivačke industrije niža je u odnosu na većinu bivših socijalističkih zemalja.

Isti istraživači tvrde kako je u prerađivačkoj industriji potrebna implementacija osmišljene inovacijske politike koja bi povezujući znanstveni i gospodarski sektor rezultirala porastom inovacijske sposobnosti industrijskih poduzeća.²

Jedno od rješenja za povećanje inovacijske sposobnosti i konkurentne prednosti svakako može biti uvođenje sustava upravljanja kvalitetom ISO 9001 iako se danas u praksi provlače zaključci kako sustav ne donosi poduzećima ništa značajno osim možda marketinških benefita, što je više povezano na način na koji se dobije (ili bolje rečeno kupi) certifikat kvalitete, a što nije tema ovog rada. Sustav upravljanja kvalitetom ISO 9001 uveden iz pravih pobuda i na pravi način zasigurno nije samo marketinški trik.

Istraživanje u Švedskoj³ je pokazalo kako tvrtke koje uvode sustav upravljanja kvalitetom ISO 9001 najčešće to rade zbog poboljšanja imidža te

¹ Nada Denona Bogović, Barbara Peteh, „Inovacijska politika u funkciji povećanja konkurentnosti prerađivačke industrije Republike Hrvatske,“ *Economic research - Ekonomska istraživanja*, Vol. 20, No. 2, 2007, str. 76-85. (dohvaćeno iz <https://hrcak.srce.hr/21466>)

² Ibid, str. 83.

³ Ivica Oslić, *Kvaliteta i poslovna izvrsnost*, M.E.P. Consult, Zagreb, 2008.

da pri tome ne trebaju gotovo ništa mijenjati u postojećem sustavu upravljanja poslovanjem. S druge strane su pronašli u istraživanju pozitivnu korelaciju između motiva managera za dobivanjem certifikata ISO 9001 i poslovnih performansi.⁴

Sustav upravljanja kvalitetom sigurno nije bez mana. Često u praksi, nakon implementacije sustava, izostanu očekivani pozitivni efekti zbog raznih razloga. Stoga je potreban ozbiljan pristup prilikom uvođenja sustava, kao i odlučno provođenje kroz cijelo poduzeće nakon implementacije jer sustav upravljanja kvalitetom nije sam sebi svrha. On bi zasigurno trebao doprinijeti određenim poboljšanjima unutar poduzeća.

Izostanak pozitivnih efekata je najčešće zbog:⁵

- velike konkurencije i katkad sniženja kriterija nekih certifikacijskih kuća;
- stajalište kako je certifikat cilj, a ne neprekidno poboljšavanje;
- neuključivanje najvišeg managementa organizacije, već pružanje samo verbalne podrške;
- previše dokumentacije koja nije dio sustava upravljanja poslovanjem organizacije;
- prevelikog korištenja usluga vanjskog konzultanta koji nedovoljno poznaje procese i poslovanje organizacije;
- neovisne vanjske ocjene usmjerene samo na pronalaženje nesukladnosti i
- globalne certifikacije u kojoj se gubi posebnost organizacije te se uspostavlja rjeđi periodički nadzor.

Uvođenje sustava radi dobivanja certifikata unaprijed je osuđeno na propast. Namjena sustava upravljanja kvalitetom kroz uvođenje norme ISO 9001 očituje se u sljedećem:⁶

- pri primjeni sustava radi povećanja konkurentne sposobnosti organizacije,
- kod zahtjeva korisnika da su određeni elementi i procesi kvalitete dio sustava kvalitete organizacije,
- u vrednovanju sustava kvalitete organizacije od strane korisnika,
- u vrednovanju sustava kvalitete organizacije od strane certifikacijske organizacije.

⁴ Mile Terziovski, Damien Power, Amrik S. Sohal, „The longitudinal effects of the ISO 9000 certification process on business performance“ *European Journal of Operational Research*, 146, 2003, pp. 580-595.

⁵ Ivica Oslić, *Kvaliteta i poslovna izvrsnost*, M.E.P. Consult, Zagreb, 200, str. 92.

⁶ Hrvoje Skoko, *Upravljanje kvalitetom*, Sinergija, Zagreb 2000, str. 158.

Zapravo, ISO 9000ff certifikatom potvrđuje se kako postoji sustav kvalitete kojim se omogućuje proizvodnja robe ili pružanje usluge onako kako je obećano kupcu i kako on očekuje.⁷

Svrha rada je prikazati prerađivačku industriju u RH kroz odabrane pokazatelje profitabilnosti dodatno ih uspoređujući s onim poduzećima koja su implementirala sustav kvalitete ISO 9001 u zadnjih nekoliko godina.

Cilj rada je analizirati poduzeća u prerađivačkoj industriji u Hrvatskoj te utvrditi postoji li razlika u odabranim pokazateljima profitabilnosti između onih koji imaju implementiran sustav kvalitete ISO 9001 u odnosu na poduzeća s najvećim prihodom u grani.

1.1. Sustav upravljanja kvalitetom ISO 9001

Pojam kvalitete potječe od grčke riječi *qualitas* što znači svojstvo, vršnoća, vrijednost, kakvoća, odlika, značajka, sposobnost. U najopćenitijem smislu, kvaliteta je svojstvo ili osobina koja označava određeni predmet ili pojavu i razlikuje ih od ostalih predmeta ili pojava.⁸

Prvi ISO 9000 certifikat izdan je jednoj organizaciji u Republici Hrvatskoj 13. studenoga 1993. godine. Broj organizacija s certificiranim sustavom kvalitete s vremenom se sve više povećava.⁹

U 2020. godini na dan 31.12. u Republici Hrvatskoj bio je 2.531 valjani certifikat ISO 9001:2015.¹⁰

Zahtjevi za kvalitetom danas su utvrđeni međunarodnim i europskim standardima. Oni u biti predstavljaju minimum koji svaki dobavljač proizvoda i/ili usluga mora danas udovoljiti da bi se kvalificirao za međunarodnu trgovinu i suradnju. Osnovni zahtjevi za sustav kvalitete standardizirani su i propisani u nizu normi ISO 9000ff.¹¹

Upravljanje kvalitetom je dio upravljanja kojim se ostvaruju ciljevi kvalitete kroz planiranje, praćenje, osiguravanje i poboljšavanje kvalitete. U

⁷ Nada Denona Bogović, Barbara Peteh, „Inovacijska politika u funkciji povećanja konkurentnosti prerađivačke industrije Republike Hrvatske“, *Economic research - Ekonomska istraživanja*, Vol. 20, No. 2, 2007, str. 76-85. (dohvaćeno iz <https://hrcak.srce.hr/21466>)

⁸ Dragutin Funda, „Sustav upravljanja kvalitetom u logistici“, *Tehnički glasnik*, Vol. 4, No. 1-2, 2010, pp. 94-98. (Preuzeto 30. 1 2022 iz <https://hrcak.srce.hr/85926>)

⁹ Miroslav Drljača, „Hrvatska korporacijska uspješnost i sustav kvalitete“, *Ekonomski pregled*, Vol. 54, No. 3-4, 2003, pp. 359-368. (Dohvaćeno iz <https://hrcak.srce.hr/25438>)

¹⁰ *ISO Survey of certifications to management system standards – Full results, 2022*. <https://isotc.iso.org/livelink/livelink?func=ll&objId=18808772&objAction=browse&viewType=1> (pristupljeno 30.01.2022.)

¹¹ Tonći Lazibat, „Sustav kvalitete i hrvatsko gospodarstvo“, *Ekonomski pregled*, Vol. 54, No. 1-2, 2003, str. 55-76. (Preuzeto 30. 01 2022 iz <https://hrcak.srce.hr/25261>)

suvremenim uvjetima upravljanje kvalitetom postaje poslovna funkcija kao i bilo koja druga funkcija (npr. financijska), s time što u njoj moraju sudjelovati ljudi svih specijalizacija i iz svih odjela u organizaciji.¹²

Implementacija ISO 9000ff glavna je prekretnica ne samo u području kvalitete, organizacije tvrtki (poslovnih subjekata) i realizacije proizvoda i pružanja usluga, već i u načinu razmišljanja milijuna ljudi širom svijeta.¹³

Osam principa upravljanja kvalitetom uklopljeni su u tekst norme, kao upute za daljnje poboljšanje sustava, i to:¹⁴

- Organizacija orijentirana na kupca,
- Orijehtacija na kupce,
- Vođenje,
- Uključivanje zaposlenika,
- Procesni pristup,
- Sustavni pristup upravljanju,
- Neprekidno poboljšanje,
- Činjenični pristup odlučivanju,
- Uzajamno korisni odnosi s dobavljačem.

Unatoč svim navedenim prednostima koje sustav upravljanja kvalitetom ISO 9001 donosi, glavni menadžeri poduzeća trebaju biti oprezni prilikom odluke o uvođenju sustava u poduzeće, računajući pri tome na povećanje profitabilnosti poduzeća. Španjolske istraživačice¹⁵ zaključuju u svome radu, u kojem su se bavile analizom utjecaja efekata normi ISO 9000 na performanse poduzeća, *kako poduzeća nikako ne bi trebala započeti proces certifikacije ako to ne traže njihovi kupci*. Drže kako su troškovi implementacije sustava i njegovog održavanja veći od mogućih koristi. Osim toga, zaključili su kako su poduzeća koja su išla u proces certifikacije zbog reklame ili su bila prisiljena od strane njihovih industrijskih kupaca imala su nakon certifikacije dodatne troškove i iste kupce. Na kraju se ipak ograđuju kako su njihovi rezultati temeljeni na istraživanju na španjolskim poduzećima.

¹² Dragutin Funda, „Sustav upravljanja kvalitetom u logistici“, *Tehnički glasnik*, Vol. 4, No. 1-2, 2010, pp. 94-98. (Preuzeto 30. 1 2022 iz <https://hrcak.srce.hr/85926>)

¹³ Tonći Lazibat, „Sustav kvalitete i hrvatsko gospodarstvo“, *Ekonomski pregled*, Vol. 54, No. 1-2, 2003, str. 55-76. (Preuzeto 30. 01 2022 iz <https://hrcak.srce.hr/25261>)

¹⁴ Preneseno iz: HR EN ISO 9000:2002, Sustavi upravljanja kvalitetom – Temeljna načela i rječnik.

¹⁵ Micaela Martinez-Costa, Angel R. Martinez-Lorente, „Triple analysis of ISO 9000 effects on company performance“, *International Journal of Productivity and Performance Management*, Vol. 56, No. 5-6, 2007, pp. 484-499.

2. PRERAĐIVAČKA INDUSTRIJA

Prema podacima Financijske agencije – FINA¹⁶ kod 136.260 poduzetnika u 2019. godini bilo je 969.776 zaposlenih na temelju sati rada. Najveći broj zaposlenih bio je, kao i ranijih godina, u prerađivačkoj industriji, koja će se analizirati u ovom radu, i trgovini. Prerađivačka industrija imala je 240.081 zaposlenog (24,8%), što znači kako gotovo svaki četvrti zaposlenik radi u ovoj industriji.

Najveći dio prihoda i rashoda ostvarili su poduzetnici u području trgovine (275,6 milijardi kuna prihoda i 266,1 milijardi kuna rashoda), u prerađivačkoj industriji (185,5 milijardi kuna prihoda i 176,6 milijardi kuna rashoda) te poduzetnici u djelatnosti građevinarstva (59,98 milijarda kuna prihoda i 58,22 milijarde kuna rashoda).

Prema neto dobiti u 2019. najbolji su poduzetnici u trgovini sa 7,4 milijarde kuna (smanjenje od 4,1% u odnosu na 2018. godinu). Drugi su poduzetnici prerađivačke industrije sa 7,2 milijarde kuna, a treći poduzetnici u području stručnih, znanstvenih i tehničkih djelatnosti sa 3,9 milijardi kuna neto dobiti.

Što sve pripada prerađivačkoj industriji prema NKD-u, odnosno tko su 14.890 poduzeća koja su svrstana u prerađivačku industriju? Ovo područje uključuje fizičke ili kemijske transformacije materijala, tvari ili sastojaka u novi proizvod, iako to ne može biti jedini i univerzalni kriterij za definiranje prerađivačke industrije. Materijali, tvari ili sastojci koji se transformiraju su sirovine koje nastaju kao proizvodi poljoprivrede, šumarstva, ribarstva, rudarstva i vađenja te drugih prerađivačkih djelatnosti. Velike promjene, obnavljanje ili rekonstrukcija proizvoda općenito se smatraju prerađivačkom industrijom.

Tablica 1. Broj poduzetnika, zaposlenika, ukupan prihod i neto dobit ili gubitak poduzetnika u RH u 2019. godini po djelatnostima NKD

Područje djelatnosti	Broj poduzetnika	Broj zaposlenih	Ukupan prihod	Dobit ili gubitak razdoblja
A Poljoprivreda, šumarstvo i ribarstvo	3.561	30.083	23.843.055.000	664.070.000

¹⁶ Rezultati poduzetnika po područjima djelatnosti u 2019. godini, FINA, 2020. <https://www.fina.hr/documents/52450/403674/Rezultati+poduzetnika+po+podrucjima+djelatnosti+u+2019.+g.doc/fc20f7ae-234f-ada8-ef6a-8c0e61464606?t=1595574140717> (pristupljeno 30.01.2022.)

B Rudarstvo i vađenje	219	3.604	3.701.897.000	16.025.000
C Prerađivačka industrija	14.890	240.081	185.460.591.000	7.245.487.000
D Opskrba električnom energijom, plinom, parom i klimatizacija	803	13.883	41.496.122.000	2.447.038.000
E Opskrba vodom; uklanjanje otpadnih voda, gospodarenje otpadom te djelatnosti sanacije okoliša	790	23.839	11.373.150.000	463.340.000
F Građevinarstvo	16.161	96.900	59.976.388.000	1.061.206.000
G Trgovina na veliko i na malo; popravak motor. vozila i motocikla	28.814	195.927	275.590.467.000	7.394.838.000
H Prijevoz i skladištenje	6.722	70.990	40.068.654.000	1.139.743.000
I Djelatnosti pružanja smještaja te pripreme i usluživanja hrane	12.729	78.871	31.313.246.000	1.600.009.000
J Informacije i komunikacije	6.765	42.741	35.825.305.000	3.127.366.000
¹⁷ K Financijske djelatnosti i djelatnosti osiguranja ¹⁸	488	5.877	5.440.129.000	-187.634.000
L Poslovanje nekretninama	5.946	12.464	11.065.169.000	359.528.000
M Stručne, znanstvene i tehničke djelatnosti	21.489	62.747	35.302.472.000	3.949.298.000
N Administrativne i pomoćne uslužne djelatnosti	6.894	46.376	18.435.147.000	508.613.000

¹⁷ Bez banaka, osiguravajućih društava i ostalih financijskih institucija koje godišnje financijske izvještaji sastavljaju na posebnim obrascima, različitim od obrazaca na kojima ih sastavljaju poduzetnici iz realnog sektora.

¹⁸

O Javna uprava i obrana; obvezno socijalno osiguranje	50	666	158.870.000	6.616.000
P Obrazovanje	1.638	7.656	1.730.966.000	97.772.000
Q Djelatnosti zdravstvene zaštite i socijalne skrbi	1.821	13.444	4.367.389.000	297.506.000
R Umjetnost, zabava i rekreacija	1.819	12.035	7.086.849.000	939.141.000
S Ostale uslužne djelatnosti	4.416	11.518	3.718.133.000	73.425.000
T Djelatnost kućanstava kao poslodavca	3	0	285.000	77.000
- Fizičke osobe bez djelatnosti	242	74	172.050.000	77.870.000
Ukupno	136.260	969.776	796.126.334.000	31.281.334.000

Izvor: FINA, Registar godišnjih financijskih izvještaja,

Rezultat prerađivačkog procesa jest proizvod koji može biti gotov u smislu da je spreman za uporabu ili konzumiranje, ili polugotov proizvod koji je input za daljnju preradu. Npr. proizvod rafinerije aluminijske jest input koji se koristi u primarnoj proizvodnji aluminijske žice; primarni aluminij input je u pogonu za izvlačenje aluminijske žice; aluminijska žica input je u proizvodnji žičanih proizvoda. Proizvodnja specijaliziranih komponenata i njihovih dijelova, pribor te dodaci strojevima i opremi, u pravilu se razvrstavaju u isti podrazred kao i proizvodnja strojeva i opreme kojima su dijelovi i pribor namijenjeni. Proizvodnja nespecijaliziranih komponenata i dijelova za strojeve i opremu, npr. motori, klipovi, električni motori, električni pribor, ventili, prijenosnici, kuglični ležajevi, razvrstava se u odgovarajući razred prerađivačke industrije bez obzira na strojeve i opremu u koju bi se ti predmeti mogli uključiti. Međutim proizvodnja specijaliziranih komponenata i pribora kalupljenjem ili protiskivanjem plastičnih materijala uključena je u skupinu 22.2. Sastavljanje od sastavnih dijelova prerađenih proizvoda smatra se prerađivačkom industrijom. To uključuje sastavljanje prerađenih proizvoda, bilo od vlastito proizvedenih komponenata, bilo od kupljenih. Reciklaža otpada, tj. prerada otpada u sekundarnu sirovinu razvrstava se u skupinu 38.3 Obnavljanje materijala. Budući da to može uključivati fizičku ili kemijsku transformaciju,

ne može se smatrati dijelom prerađivačke industrije. Osnovna funkcija tih djelatnosti jest obrada ili prerada otpada te se stoga razvrstavaju u područje E Opskrba vodom; uklanjanje otpadnih voda, zbrinjavanje otpada te sanitarne i slične djelatnosti. Međutim, proizvodnja novih finalnih proizvoda (za razliku od proizvodnje sekundarnih sirovina), razvrstava se u prerađivačku industriju, pa čak i ako se ti procesi koriste otpadom kao inputom, npr. proizvodnja srebra iz istrošenog filma smatra se proizvodnim procesom. Specijalizirana održavanja i popravci industrijskih, poslovnih i sličnih strojeva i opreme u pravilu se razvrstavaju u odjeljak 33 Popravak i instaliranje strojeva i opreme. Međutim popravci računala te predmeta za osobnu uporabu i kućanskih aparata razvrstavaju se u odjeljak 95 Popravak računala i predmeta za osobnu uporabu i kućanstvo, dok se popravak motornih vozila razvrstava u odjeljak 45 Trgovina na veliko i na malo; popravak motornih vozila i motocikla. Instaliranje industrijskih strojeva i opreme, kada se obavlja kao specijalizirana djelatnost, razvrstava se u 33.20. Napomena: granica između prerađivačke industrije i drugih područja klasifikacijskog sustava katkad može biti nejasna. Kao općenito pravilo, prerađivačka djelatnost bavi se transformacijom sirovina u novi proizvod. Output je novi proizvod. Međutim definicija onoga što čini novi proizvod može biti prilično subjektivna. Za objašnjenje, sljedeće se djelatnosti smatraju prerađivačkima u NKD-u:

- prerada svježije ribe (priprema oštriga, ribljih fileta) koja se ne obavlja na brodu,
- pasterizacija mlijeka i punjenje u boce,
- konvertiranje kože,
- impregnacija (zaštita) drva,
- tiskanje i srodne djelatnosti,
- protektiranje guma,
- proizvodnja gotove smjese betona,
- elektroprevlačenje, prevlačenje i toplinska obrada metala,
- obnavljanje strojeva (npr. automobilskih motora),

Suprotno tomu, postoje djelatnosti koje se katkad smatraju prerađivačkom industrijom, ali se u NKD-u razvrstavaju u druga područja (tj. ne razvrstavaju se u prerađivačku industriju). One uključuju:

- sječu drva, razvrstanu u područje A Poljoprivreda, šumarstvo i ribarstvo,
- iskorištavanje poljoprivrednih proizvoda, razvrstano u područje A Poljoprivreda, šumarstvo i ribarstvo,
- pripremu hrane za neposrednu potrošnju na licu mjesta, razvrstanu u odjeljak 56 Djelatnosti pripreme i usluživanja hrane i pića 22,

- iskorištavanje ruda i drugih minerala, razvrstano u područje B Rudarstvo i vađenje,
- izgradnju građevina i operacije koje se izvode na gradilištu, a razvrstane su u područje F Građevinarstvo,
- djelatnosti razdvajanja proizvoda u rinfuzi i preraspodjele u manje količine, uključujući pakiranje, prepakiranje ili punjenje u boce kao što su liker i kemikalije; sortiranje otpada; miješanje boja prema narudžbi kupca; rezanje metala prema narudžbi kupca; obrada čiji rezultat nisu različita dobra razvrstava se u područje G Trgovina na veliko i na malo; popravak motornih vozila i motocikala.¹⁹

3. PROVEDENO ISTRAŽIVANJE

Da bi se dobila svrha i cilj ovog rada provedeno je empirijsko istraživanje, na način da su postavljene istraživačke hipoteze te na temelju postavljenih hipoteza doneseni određeni zaključci.

3.1. Istraživačke hipoteze

Za potrebe istraživanja postavljene su istraživačke hipoteze:

H1: Poduzeća koja su uvela sustav upravljanja kvalitetom ISO 9001 imaju bolje pokazatelje profitabilnosti u odnosu na prvih 200 poduzeća po iskazanom prihodu u prerađivačkoj industriji.

H2: Poduzeća koja su kroz dulji vremenski period implementirala sustav upravljanja kvalitetom ISO 9001 otpornija su na pojavu krize u prerađivačkoj industriji.

3.2. Metodologija

Prvi istraživački skup (uzorak) sačinjavaju prvih 200 poduzeća po prihodu u prerađivačkoj industriji. Navedena poduzeća zapošljavaju 37,0% svih zaposlenika u industriji, ostvaruju 59,4% prihoda prerađivačke industrije te 81,7% dobiti. Na temelju ovih podataka može se zaključiti kako je 200 poduzeća iz uzorka (od ukupnog broja 14.890 u populaciji) ona s izuzetno dobrim pokazateljima profitabilnosti (ostvaruju 81,7% dobiti cijele grane) te da usporedba s njima može pružiti dobru sliku u odnosu na drugi istraživački

¹⁹ NKD 2007. s objašnjenjima, 2007. Preuzeto 30.1.2022 iz: https://www.dzs.hr/App/NKD_Browser/assets/docs/NKD_2007_objasnjenja.pdf

skup (uzorak) koji čine 21 poduzeće koje je implementiralo sustav upravljanja kvalitetom ISO 9001 u jednoj od tri godine (2017., 2018. ili 2019.).

Ovdje je potrebno naglasiti kako autori nisu mogli nikako pronaći odgovarajući registar poduzeća u Hrvatskoj koja su uvela sustav upravljanja kvalitetom ISO 9001, te su morali pristupiti svojim „privatnim kanalima“ kako bi došli do određenog broja poduzeća u prerađivačkoj industriji. Na kraju su uspjeli dobiti podatke za 21 poduzeće što svakako predstavlja ograničenje u istraživanju (uzorak bi svakako trebao biti veći od 30), a s druge strane i ovakav uzorak može poslužiti za prikaz određenih trendova, naročito kada se uzme da je prvi uzorak od 200 najvećih u potpunosti reprezentativan.

Tablica 2. Analiza uzorka prvih 200 poduzeća prema broju zaposlenika, prihodu i dobiti

C - Prerađivačka industrija	Populacija	Uzorak (prvih 200)	%
Broj zaposlenika	240.081	88.726	37,00%
Prihod	185.460.591.000	110.121.339.800	59,40%
Dobit ili gubitak	7.245.487.000	5te .920.698.300	81,70%

Izvor: Izvorno autorsko

Temeljem dostupnih podataka o poslovanju navedenih poduzeća prikupljeni su podaci iz godišnjih financijski izvješća (GFI-POD) a dostupni su u bazama podataka Financijske agencije (FINA) i portala Poslovna.hr.

Prikupljeni podaci obrađeni su na osobnom računalu pomoću programskog paketa za tablične proračune Microsoft Excel i programa za statističku analizu podataka IBM SPSS v.26.

Pri tome su korišteni različiti pristupi analizi prikupljenih podataka, uobičajeni kod primjene statističke znanstvene metode. Oni uključuju:

- deskriptivnu statističku analizu prikupljenih podataka koja prikazuje mjere centralne tendencije, mjere varijabiliteta te grafičke i tablične prikaze osnovnih statističkih vrijednosti;
- inferencijalna statistika koja se odnosi na provjeravanje postavljenih hipoteza uz pomoć statističkih testova, koeficijenata i njihove značajnosti.

Tablica 3. Definiranje i opis nezavisne varijable

Nezavisne varijable	Puni naziv	Definicija varijabli
Prvih 200	C – Prerađivačka industrija (prvih 200 po prihodu)	Klasifikacija prema NKD-u
Certificirane tvrtke - 21	C – Prerađivačka industrija (certifikat ISO 9000)	Klasifikacija prema NKD-u

Izvor: Izrada autora.

Zavisne varijable korištene u empirijskom istraživanju čine najčešći pokazatelji profitabilnosti poslovanja koji se koriste u praksi.

Tablica 4. Definiranje i opis zavisnih varijabli

Zavisne varijable	Puni naziv	Definicija varijabli
NPM	Neto profitna marža (engl. Net Profit Margin) - NPM	NPM = neto dobit razdoblja/ ukupni prihod
ROA	Povrat na uloženu imovinu (engl. Return On Assets) - ROA	ROA = Dobit razdoblja/ukupna imovina
ROE	Povrat na uloženi vlastiti kapital (engl. Return On Equity) - ROE	ROE = Dobit razdoblja/ukupni kapital

Izvor: Izrada autora.

U nastavku, prezentiraju se rezultati istraživanja.

4. REZULTATI

Početna analiza je pokazala kako postoje pojave ekstremnih vrijednosti kod izračunatih aritmetičkih sredina pojedinih pokazatelja. Stoga se odmah pojavila dilema koji pokazatelj koristiti u daljnjem istraživanju.

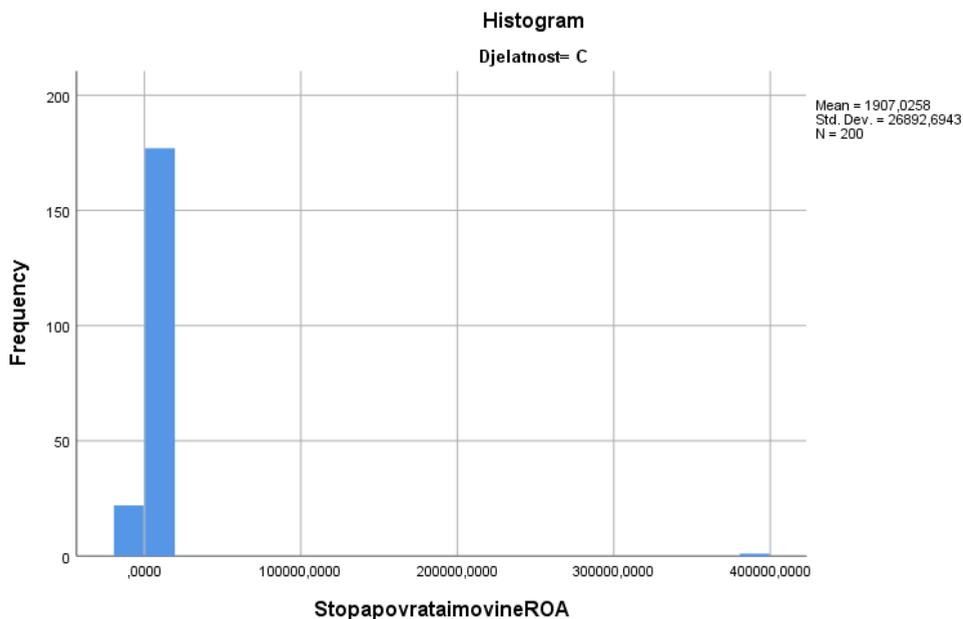
Tablica 5. Deskriptivna statistička analiza odabranih pokazatelja 200 najvećih tvrtki po prihodu iz prerađivačke industrije (grupa C po NKD-u)

		NPM(%)- 16	NPM(%)- 17	NPM(%)- 18	NPM(%)- 19	ROE(%)- 16	ROE(%)- 17
N	Valid	195	195	200	200	189	188
	Missing	5	5	0	0	11	12
Mean		5,0900	2,9100	3,2100	5,3700	12,2141	8,1699
Median		4,4600	3,2600	4,0900	4,2000	9,7115	9,7364
		ROE(%)- 18	ROE(%)- 19	ROA(%)- 16	ROA(%)- 17	ROA(%)- 18	ROA(%)- 19
N	Valid	193	194	195	195	200	200
	Missing	7	6	5	5	0	0
Mean		-3,3647	9,7943	5,7672	4,7393	4,4623	1907,0258
Median		9,6718	9,7246	4,3777	3,5412	3,8785	4,8907

Izvor: Izvorno autorsko (Statistička obrada u programu SPSS, N=200).

Upravo pojava ekstremnih vrijednosti primjerice u 2019. godini (Grafikon 1) ili pak u 2016. i 2018. jasno pokazuje kako bi korištenje aritmetičke sredine koja je osjetljiva na ekstremne vrijednosti umjesto medijana doprinijela donošenju pogrešnih zaključaka.

Grafikon 1. Distribucija podataka za ROA u 2019. godini



Izvor: Izvorno autorsko (Statistička obrada u programu SPSS, N=200).

Medijan (centralna vrijednost, engl. median) je statistički pojam koji određuje sredinu distribucije. Pola vrijednosti skupa (distribucije) nalazi se iznad medijana, a pola ispod. Medijan je manje osjetljiv na ekstremne vrijednosti od aritmetičke sredine, što ga čini posebno pogodnom za nepravilne asimetrične distribucije.²⁰

Stoga će se u nastavku istraživanja uzimati medijan kao vrijednost pokazatelja profitabilnosti po godinama istraživanja.

²⁰ Mladen Rajko, Berislav Bolfek, Ivica Zdrilić, „Suvremeni trendovi u poduzetništvu,“ *Suvremeno poduzetništvo*. Sveučilište u Zadru, Zadar, 2022, str. 198.

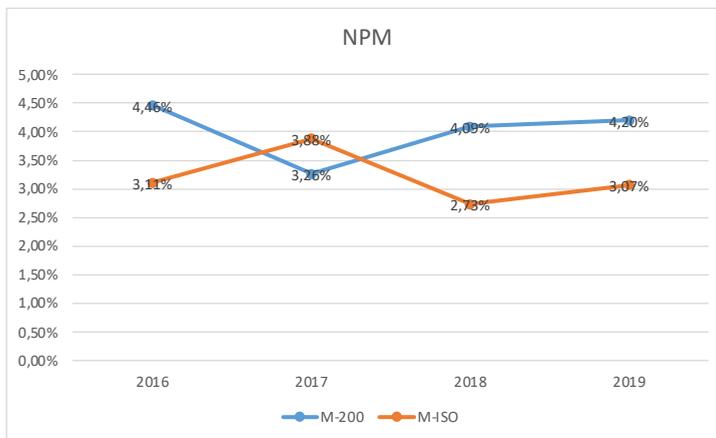
Tablica 6. Deskriptivna statistička analiza odabranih pokazatelja 21 poduzeća koja posjeduje certifikat ISO 9001 iz prerađivačke industrije (grupa C po NKD-u)

		NPM(%)-16	NPM(%)-17	NPM(%)-18	NPM(%)-19	ROE(%)-16	ROE(%)-17
N	Valid	21	20	21	21	21	20
	Missing	0	1	0	0	0	1
Mean		5,6386	4,2615	4,1324	3,9876	24,4667	20,8000
Median		3,1100	3,8750	2,7300	3,0700	12,7000	11,8000
Std. Deviation		7,69625	3,71750	6,30982	7,45102	35,74047	27,50388
Variance		59,232	13,820	39,814	55,518	1277,381	756,463
Range		31,23	13,92	27,63	30,51	156,40	113,50
Minimum		-8,77	0,05	-8,21	-10,30	-56,50	0,10
Maximum		22,46	13,97	19,42	20,21	99,90	113,60
Percentiles	25	1,1000	0,8300	0,6400	0,7300	3,8000	2,7750
	50	3,1100	3,8750	2,7300	3,0700	12,7000	11,8000
	75	8,1700	5,9725	7,4350	6,2350	43,1000	26,0250
		ROE(%)-18	ROE(%)-19	ROA(%)-16	ROA(%)-17	ROA(%)-18	ROA(%)-19
N	Valid	21	21	21	19	21	21
	Missing	0	0	0	2	0	0
Mean		17,1286	18,4476	10,5905	8,0421	6,7143	6,7857
Median		9,7000	14,0000	5,4000	4,1000	5,1000	5,5000
Std. Deviation		21,76433	24,86249	15,16934	11,43597	7,31630	7,68604
Variance		473,686	618,144	230,109	130,781	53,528	59,075
Range		92,00	112,40	58,80	48,10	32,90	29,00
Minimum		-14,90	-6,20	-20,20	0,40	-8,40	-5,90
Maximum		77,10	106,20	38,60	48,50	24,50	23,10
Percentiles	25	3,7500	2,7500	1,5000	2,2000	2,2500	1,6000
	50	9,7000	14,0000	5,4000	4,1000	5,1000	5,5000
	75	28,4000	28,7000	21,0500	10,1000	11,3500	12,8500

Izvor: Izvorno autorsko (Statistička obrada u programu SPSS, N=21).

Zanimljivo je dobivene podatke „upariti“ i usporediti medijalne vrijednosti pojedinih pokazatelja po godinama prikazujući na istom grafikonu podatke za prvih 200 poduzeća i 21 poduzeće koje je uvelo sustav upravljanja kvalitetom ISO 9001.

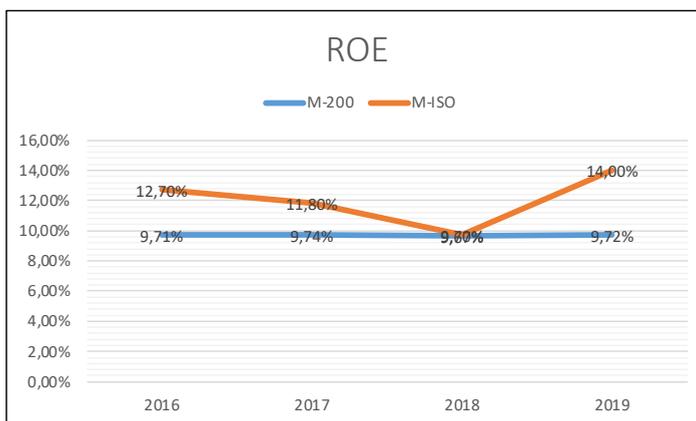
Grafikon 2. Usporedba Neto profitne marže kod najvećih 200 poduzeća i 21 poduzeće koja posjeduje certifikat ISO 9001 u prerađivačkoj industriji (grupa c po NKD-u)



Izvor: Izvorno autorsko (Statistička obrada u programu SPSS, Excel, N1=200, N2=21).

Usporedba vrijednosti NPM (neto profitne marže) po godinama ne sugerira na određenu prednost jednih poduzeća u odnosu na druge jer se linije „međusobno isprepleću“ kako je prikazano na grafikonu 2.

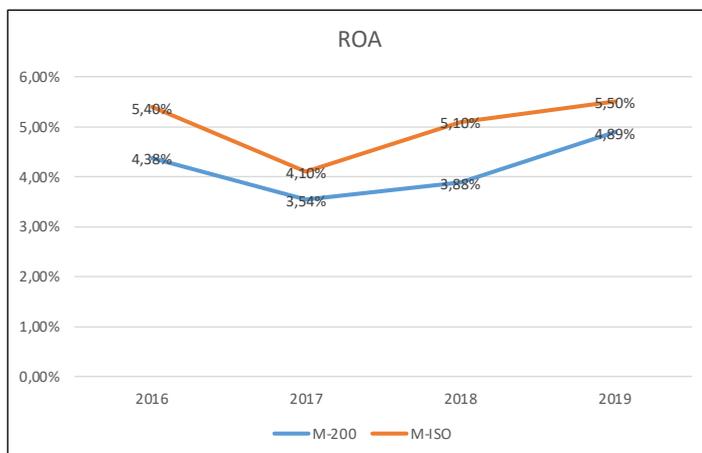
Grafikon 3. Usporedba ROE-Povrat na uloženu imovinu kod najvećih 200 poduzeća i 21 poduzeće koja posjeduje certifikat ISO 9001 u prerađivačkoj industriji (grupa c po NKD-u)



Izvor: Izvorno autorsko (Statistička obrada u programu SPSS, Excel, N1=200, N2=21).

Usporedba vrijednosti ROE (povrat na uloženi kapital) po godinama pokazuje određenu razliku u korist poduzeća koja su uvela sustav upravljanja kvalitetom ISO 9001. Pri tome se vidi kako pokazatelj u 2019. godini značajno raste kod poduzeća koja su uvela sustav, za razliku od ostalih poduzeća čiji je pokazatelj prilično stabilan tijekom cijelog istraživačkog perioda. Da je analiza uzela u obzir aritmetičke sredine razlika bi bila još značajnija i vidljivija kroz cijeli period.

Grafikon 4. Usporedba ROA-Povrat na uloženi kapital kod najvećih 200 poduzeća i 21 poduzeće koja posjeduju certifikat ISO 9001 u prerađivačkoj industriji (grupa c po NKD-u)



Izvor: Izvorno autorsko (Statistička obrada u programu SPSS, Excel, N1=200, N2=21)

Usporedba vrijednosti ROA (povrat na uloženi imovinu) po godinama pokazuje kontinuiranu razliku u korist poduzeća koja su uvela sustav upravljanja kvalitetom ISO 9001.

Može se zaključiti kako poduzeća koja su uvela sustav upravljanja kvalitetom ISO 9001 pokazuju nešto bolje rezultate u odnosu na 200 najvećih poduzeća iz iste industrijske grane. Razlike nisu velike jer se s druge strane radi o 200 najvećih poduzeća koja su u biti nositelji ove industrijske grane, ali se ipak pojavljuju, što sugerira kako poduzeća s uvedenim sustavom upravljanja kvalitete ISO 9001 imaju bolje pokazatelje profitabilnosti.

Na temelju dobivenih rezultata istraživanja može se djelomično prihvatiti prva istraživačka hipoteza o povezanosti **sustava upravljanja kvalitetom**

ISO 9001 i pokazatelja profitabilnosti kod poduzeća u prerađivačkoj industriji.

S obzirom da su istraživana poduzeća prvi put certificirana u jednoj od tri godine (2017., 2018., 2019.) zanimljivo je analizirati postoji li korelacija između duljine posjedovanja certifikata na pokazatelje profitabilnosti u 2020. godini. To je u prvom redu zanimljivo da bi se mogla testirati „otpornost“ takvih poduzeća na pojavu globalne financijske krize uzrokovane pandemijom virusa COVID-19.

Tablica 7. Korelacija između godine prve certifikacije sustava upravljanja kvalitetom ISO 9001 i pokazatelja profitabilnosti u 2020. godini

Correlations					
		Cerifikacija	NPM(%) -20	ROE(%) -20	ROA(%) -20
Cerifikacija	Pearson Correlation	1	-,436*	-,466*	-,384
	Sig. (2-tailed)		,048	,033	,086
	N	21	21	21	21
NPM(%) -20	Pearson Correlation	-,436*	1	,815**	,966**
	Sig. (2-tailed)	,048		,000	,000
	N	21	21	21	21
ROE(%) -20	Pearson Correlation	-,466*	,815**	1	,890**
	Sig. (2-tailed)	,033	,000		,000
	N	21	21	21	21
ROA(%) -20	Pearson Correlation	-,384	,966**	,890**	1
	Sig. (2-tailed)	,086	,000	,000	
	N	21	21	21	21
* . Correlation is significant at the 0.05 level (2-tailed).					
** . Correlation is significant at the 0.01 level (2-tailed).					

Izvor: Izvorno autorsko (Statistička obrada u programu SPSS, N=21).

Rezultat provedenog korelacijskog testa pokazuje kako postoji negativna korelacija između godine prve certifikacije i promatranih pokazatelja profitabilnosti u 2020. godini. Negativna korelacija znači kako poduzeća koje su ranije certificirani imaju bolji pokazatelje profitabilnosti. Međutim statistički značajna su korelacije između dužine posjedovanja certifikata sustava upravljanja kvalitetom ISO 9001 i NPM(%) i ROE(%) na razini značajnosti od 5% dok korelacija s ROA(%) postoji, ali nije statistički značajna.

Ovime se djelomično može potvrditi druga istraživačka hipoteza (H2) kako su poduzeća u prerađivačkoj industriji koja su kroz dulji vremenski period implementirala sustav upravljanja kvalitetom ISO 9001 otpornija na pojavu krize odnosno imaju bolje pokazatelje profitabilnosti.

Rezultati idu u prilog tome kako su poduzeća koja su ranije uvela sustav upravljanja kvalitetom ISO 9001 „otpornija“ na pojavu krize u 2020. godine koja je uzrokovana pandemijom COVID-19. Ispitivani uzorak od 21 poduzeća je bio mali te je mogao utjecati na rezultate provedenog testa stoga je potrebno dobivene rezultate uzeti s određenom rezervom.

5. ZAKLJUČAK

Cilj je svake organizacije postizanje uspjeha u poslovanju. Taj se uspjeh iskazuje, uz ostalo, u dokazanoj kvaliteti proizvoda. Međutim, kvaliteta je subjektivna kategorija i podložna je različitim shvaćanjima i kriterijima.

Ono što korisnika u pogledu kvalitete zadovoljava danas, sutra može biti potpuno neprihvatljivo.²¹

To znači da je kvaliteta „promjenjiva vrijednost“ te da ju treba shvaćati kao ono što kupci hoće. Jedan od načina kako to postići sigurno je uvođenje sustava kvalitete ISO 9001 u poduzeće. Uvođenjem sustava kvalitete osigurati će se preduvjeti da poduzeće može odgovoriti zahtjevima svojih, kako sadašnjih, tako i budućih kupaca te ispuniti njihova očekivanja. Ono što je pri tome svakako važno za poduzeće jest postizanje odgovarajućih rezultata poslovanja koje će mu omogućiti opstojnost na tržištu. Bez obzira koliko smo zadovoljili očekivanja i ispunili želje kupaca da bi poduzeće imalo kontinuitet poslovanja mora osigurati određene financijske rezultate koje će mu osigurati da ispunji sve svoje obveze koje ima prema svojim vjerovnicima, a u istom trenutku osigura mogućnost neprestanog rada.

Rezultati istraživanja su pokazali kako poduzeća koja posjeduju sustav upravljanja kvalitetom ISO 9001 donekle imaju bolje pokazatelje profitabilnosti.

Istraživanje među poduzećima koja su uvela sustav upravljanja kvalitetom ISO 9001 je pokazalo kako su poduzeća koja su ranije uvela sustav upravljanja kvalitetom ISO 9001, odnosno isti posjeduju duži vremenski period su „otpornija“ na pojavu krize u 2020. godine koja je uzrokovana pandemijom COVID-19, jer su im pokazatelji profitabilnosti bolji.

²¹ Dragutin Funda, „Sustav upravljanja kvalitetom u logistici“, *Tehnički glasnik*, Vol. 4, No. 1-2, 2010, p. 96. (Preuzeto 30. 1 2022 iz <https://hrcak.srce.hr/85926>)

Ograničenje u provedenom istraživanju je relativno mali broj poduzeća koja su uključena u istraživanje, a posjeduju sustav upravljanja kvalitetom ISO 9001. Razlog tome je nepostojanje na jednom mjestu podataka o takvim poduzećima. Stoga je jedna od preporuka poticanje za formiranje jednog sveobuhvatnog registra poduzeća u RH koja imaju uveden sustav upravljanja kvalitetom ISO 9001, a u što bi trebali biti uključeni i ostale certifikati (poput ISO 14001, 27001, 22000, 4500, itd.). Ovi podaci, osim što bi olakšali istraživačima rad zasigurno bi doprinijeli boljim i kvalitetnijim istraživanjima i ono što je pri tome izuzetno bitno rezultatima koji bi bili u potpunosti reprezentativni.

Druga preporuka je ponavljanje jednog ovakvog ili sličnog istraživanja u budućnosti kako bi se rezultati potvrdili ili opovrgli. Osim toga bit će jako zanimljivo provesti istraživanje u narednim godinama o utjecaju pandemijskih kriznih godine (2020., 2021. i 2022.) na rezultate poslovanja poduzeća s posebnim osvrtom na ona koja imaju uveden sustav upravljanja kvalitetom ISO 9001.

Summary:

IS THERE A LINK BETWEEN THE ISO 9001 QUALITY MANAGEMENT SYSTEM AND PROFITABILITY INDICATORS IN THE MANUFACTURING INDUSTRY?

Product quality is one of the main criteria for gaining competitive advantage over the competition. On the other hand, criticism is often levelled that quality cannot be measured, namely its effects on business profitability. Quality management is the part of management that achieves quality goals through planning, monitoring, ensuring and improving quality. The manufacturing industry in the Republic of Croatia represents an important segment of the Croatian economy, and one of its characteristics is lower competitiveness compared to other countries and the need for competitiveness and innovation capabilities in response to increasing competition and globalisation. In this paper, a research was conducted including the 200 largest companies in the manufacturing industry, analysing their profitability indicators. In addition, 21 companies from the manufacturing industry that introduced the ISO 9001 quality management system were included in the research. A comparison of all companies and their indicators led to certain conclusions indicating that companies that have introduced the ISO 9001 quality management system have better profitability indicators in reference to the 200 largest in the manufacturing industry

Key words: quality, quality management system, ISO 9001, manufacturing industry.

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**QUALITY DEVELOPMENT STRATEGIES IN
CONNECTION
WITH THE NEW EU CAP AND THE COVID-19
PANDEMIC**

STRATEGIJE RAZVOJA KVALITETE VEZANO UZ NOVU
ZAJEDNIČKU POLJOPRIVREDNU POLITIKU EU I PANDEMIJU
COVID-19

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ABSTRACT

With increasing income of the world population there is an increasing demand for quality products. The motion of quality of agro-food products is not stable. It is changing by time, by groups of people, by technological developments, by changes in the societal environment. In the view of the consumers besides the quality of the products themselves, another substantial element for their buying decisions are the connected services, like packaging, delivery, behavior (kindness) of the selling personal. Two substantial societal impacts in recent time for the perception of quality are the worldwide COVID-19 pandemic and – especially in Europe – the new Common Agricultural Policy (CAP) for the period 2023-27. In this paper the authors aim

is to analyze the characteristic elements of these challenges and the reaction of the world – and especially of Hungary – to them.

Key words: quality Common Agricultural Policy, kvaliteta, quality development strategies.

1. COMMON AGRICULTURAL POLICY (CAP) OF THE EUROPEAN UNION

In recent time quality policy plays an increasing role within the Common Agricultural Policy (CAP). The European Commission published 28th May 2009 a Communication „on agricultural product quality policy. Before publishing the Communication, the Commission had a wide consultation with producers and trade and other stakeholders. To draw the conclusions, a High level Conference on Agricultural Product Quality was held in Prague in March 2009.

In the Communication the Commission declares, that product quality has two aspects: 1) the product characteristics (like size, taste etc.) and 2) the farming attributes (like production method, type of animal husbandry etc.). The EU has – even in worldwide comparison – very strict legal regulations with respect to environment protection, animal welfare, use of pesticides and veterinary products, which ensure the overall high quality of EU products. Beyond this, farmers and processors are willing to undertake even more strict rules of the production and of processing, to differentiate their products from those of other producers, to attire the interest of the consumers.

The Communication outlines two main ways to prove the additional quality of the products: the certification (e.g. „organic product”, PDO, PGI, TSG) and the labeling (e.g. marketing standards, product classes, „product from national park” etc.) Quality labels protect and promote origins, traditions and unique characteristics of many distinctive EU products. Studies show, that if a product has a quality label, in exports it helps to promote the product, makes it more competitive, while in imports it has a kind of „trade restrictive” effect. Quality schemes in the EU are the PDO (Products with Denomination of Origin), PGI (Product with Geographical Indication), the TSG (Traditional Specialty Guaranteed) and the Organic Products. The Geographical Indications (GI-s) enjoy protection based on intellectual property rights.

EU producers of agri-food products often complain, if in a trade agreement the EU applies tariff reductions for third countries. The reasoning is, that while imported products have to meet the product specific requirements (e.g.

additives), the third country producers do not have to apply the same restrictions for the production (e.g. environmental or animal welfare regulations) The Commission encourages EU producers not to consider this difference as a burden, but rather as an opportunity, as a competitive instrument. While explaining to the consumers, how their products are meeting high expectations compared to the imported products, EU producers may gain market shares and higher premiums (Green Paper of the EU). Anyhow these kinds of „explanations” need budgetary backing and a wide range of promotional activities (brochures, videos, tastings etc.) A good example for such tools is the Commission initiated set of recipes, using products with quality labels and the Cookbook, where renewed European chefs suggest, how unique products with GI from their country can be incorporated into dishes.

Taken into account the considerations of the European farmers, according recent information the French Presidency of the European Union Council would like to initiate talks on including into third countries trade agreement also environmental and animal welfare aspects of production processes.

The EU Regulation 1151/2012 of 21st November 2012 lays down the rules on quality schemes for agricultural and food products. This Regulation strengthens and simplifies the quality schemes, the administration of them. Based on the initial experiences EU Regulation 664/2014 explains further, how Regulation 1151/2012 should be applied.

The European Union started to prepare a new CAP – originally for 2021-2027 - by a Commission Proposal in June 2018. In this proposal it was stated that „Agriculture and rural areas are central for the European Green Deal, and the new CAP will be a key tool in reaching the ambitions of the Farm to Fork and the biodiversity strategies.”

The Commission identified nine specific objectives; several of them are closely connected to quality.

- To increase **competitiveness** and agricultural productivity in a sustainable way to meet the challenges of a higher demand of the consumers in Europe and beyond;
- **Environmental care**, with the aim to foster sustainable development and efficient management of the natural resources soil, water and air;
- To improve the response of EU agriculture to societal demands on **food and health**, including safe, nutritious and sustainable food, reducing food waste;
- To contribute to the protection of **biodiversity**, enhance ecosystem services, to preserve **landscapes** and habitats.

The green ambitions foreseen should be higher than in previous programming periods and are in line with environmental and climate legislation. 25% of the budget for direct payments (in the 1st pillar) should be allocated to eco-schemes, providing stronger incentives for environment – and climate friendly farming practices (like organic farming, agro-ecology), as well as to improvements in animal welfare. Within the 2nd Pillar at least 35% of the funds should be allocated to measures, which support biodiversity, climate, animal welfare and environment.

In support to increasing value added and quality of agricultural and food products, **research, knowledge-sharing and innovations** shall have a higher priority, than before. Member States have to establish an Agricultural Knowledge and Information System (AKIS). Besides the national budgets, in the Community-led program Horizon Europe 10 billion euros are foreseen for research and innovation.

2. REACTION OF HUNGARY ON THE NEW CHALLENGES

After a long negotiating process the regulations on the new CAP were published 6th December 2021. Among the three legislative acts EU Regulation 2115/2021 provides for the rules on the Strategic Plans. Member States have to prepare and submit to the Commission a Strategic Plan until 31st December 2021. In this Plan the national implementation of the new CAP legislation has to be presented both for the 1st Pillar – direct payments and market measures – and the 2nd Pillar – Rural development. The Commission must evaluate the Plan, consult with the Member State and approve the Plan within six months after submission. The new CAP will be implemented by 1st January 2023.

Hungary has prepared its Strategic Plan parallel with progress on the negotiations on the CAP legislation. During the work on the Plan, three consultations with the stakeholders were held. A final draft was published by the Ministry of Agriculture, 15th December 2021 for opinions from the stakeholders. The following information are partly based on this draft summary.

The basis of the Strategic Plan is the Hungarian Government's Program for „Renewing Rural Areas, renewing agri-food sector”. According to this program agriculture should turn in Hungary into a profitable activity acknowledged by the society, in an attractive rural environment, with modern technology and by sustainable use of natural resources. The outcome of all these factors shall be high quality agricultural and food products. To support the realization of these objectives the Government decided at the beginning

of 2021 that from national budget the contribution to the 2nd Pillar of the CAP – Rural Development – should attain 80% in the period 2021-27, instead of 17% in the previous period (2014-2020). In result of this decision the total disposable amount for rural development is 4285 billion Forints (ca. 12 billion Euros). More than 50% of this amount will support investments for the modernization of the agri-food sector with the aim of producing high quality products for both the internal and the external markets. Highest priority will be given to investments into the processing industry, to increase value added of the products. As a result of these investments value added/food industrial employee should increase at fixed prices by 20 %, between 2020 and 2030. Also, in agriculture cost-efficiency and value added shall increase because of the investments, by 53% hectare between 2020 and 2030. Hungary is traditionally a net exporting country. As a result of increase in value added both in agriculture and food processing, total agri-food exports from Hungary will grow by 57% within the same period.

3. GREEN FUTURE

Following the ambitious green objectives and requirements of the EU legislation, Hungary applies in the planning process a complex approach. The green future will be reached by an architecture combining conditionality, the agro-ecological base program, the Agricultural Environmental Program (AEP), investments promoting energy – and resource efficiency, investments for the use of renewable energy, forestry measures and measures to preserve genetically resources. Within the 1st Pillar the share of „green measures” should be minimum 25%. The Strategic Plan foresees mainly measures for soil and water protection and for the protection of biodiversity. In the 2nd Pillar the share of „green measures” must reach at least 30%. The investments, the forestry and the genetics-related measures are fulfilling this requirement. Some of the measures in the 2nd Pillar, to promote environmental sustainability, are:

- Support to organic production. In Hungary the share of organic production within agriculture in 2020 was about 6%. By 2030 this share should increase to 20-25%, that is about 1 million hectares.
- Support to non-productive agro-ecological investments, creation of wetland habitats, agro-forestry measures.
- Compensatory payments for NATURA 2000 areas, whereas the meadows help to maintain biodiversity.
- Support to animal welfare measures, which go beyond the general

- requirements and are taken by the producers to meet high consumer demands.
- Support to forestry measures, to undertakings of forestry plantations to offset effects of climate change.

The sustainable production technologies lead to products, which are healthier than in earlier times. They will meet demand of consumers, who consider besides product quality attributes also environmental and societal aspects.

4. FOOD INDUSTRY

An investment into the food processing is a high priority of the 2023 and 27 Hungarian Strategic Plan. Based on the high quality and great quantity of agricultural raw material, food industry developments can contribute to increase the value-added products, to increase agri-food exports, to improve employment and incomes and to improve the quality of living conditions in rural areas.

The Hungarian Ministry of Agriculture – in cooperation with the relevant stakeholders – developed a National Food Industry Strategy, which was approved by the Government in May 2015. A next important document to reorganize and stabilize the food industry was the Hungarian Food Book, the Codex Alimentarius Hungaricus. It contains the requirements, guidelines, and control methods for the different areas of food industry. It contains provisions for food quality, for labeling and for food safety. The main chapters of the Food Book were published as decrees of the Minister of Agriculture.

As for mass products the aim of the Strategic Plan is to support investments which are viable and competitive also in international comparison, which help to improve contractual relations between suppliers, processors, and traders.

Another aim is to support small and medium-size food processors in developing own whole-and retail trade activities with the aim to stabilize selling and to have a higher share of the supply-chain profit.

Joint investments of producer cooperation will also be supported to have a more direct contact between agricultural production, food processing and trade.

The technological developments should be innovative, cost-efficient, environment-conscious, and sustainable. Food safety and hygiene aspects must be considered; traceability of the products shall be ensured. Logistic and storing capacities must be enlarged, modernized and step by step digitalizes.

Digitalization will play an important role in the investments both for agriculture and for food industry. It may help to be more cost-efficient, to decrease the need on inputs, but also to decrease waste, especially that of food.

5. QUALITY POLICY MEASURES

Investments into greener and more competitive agriculture and food industry will produce higher quality and healthier food products. Also, in this segment of the market there is strong competition within the EU and worldwide. One of the trumps in this competition can be quality in the production and with regards the products. The Hungarian Strategic Plan includes specific measures for the quality policy as well:

- Support will be given to producers, who decide to join existing quality assurance and quality management systems (like HACCP, ISO, BRC, IFS, EMAS, FSC). This will be a new kind of support, which did not exist in earlier CAP periods. Still joining such systems is unavoidable for those producers, who wish to market products to wholesale chains or big processing companies. Anyhow to receive such accreditation is very time- and cost consuming, especially if the producer wishes/needs to join several systems. One special award for quality management is the European Business Model of Excellence, which is managed by the Brussels based European Foundation for Quality Management (EFQM). This award goes to companies acknowledging the excellence of the whole activity of the company. Requirements are established for 7 different areas of activities. To receive the award takes several years of improvements in the management of a company. Based on the EFQM Model 2020, Hungary has introduced a National Award of Excellence. The celebration of the 5 winner companies took place in November 2021. There was one agricultural company, which received a diploma, named Hoda-gro Co. In preparing the company for the application the Hungarian National Committee of the European Organization of Quality (HNC for EOQ) played an important preparatory and advisory role.
- Continuation of already existing support will be available for producers, producer groups, municipalities, who wish to create an own quality system, or join an existing one, and to the promotion of their products. Such systems are the PDO, PGI and TSG, but there exist also voluntary national/regional quality systems.

Based on the long tradition of Hungary to produce high quality agricultural, food products and handicraft products, which are often connected to certain regions or areas, the implementation of industrial property rights has also a more than 100 years history. Besides the trademarks in recent decades the protection of geographical indications is gaining more and more importance.

Hungary joined the European Union in 2004. Still already in 1998 – with French assistance – the Ministry of Agriculture started to develop a national geographical indication system, which was called Traditions-Tastes-Regions (Hagyományok-Ízek-Régiók, HÍR Program). A wide research work started, which included geographical, human, historical, production technology, reputation aspects and the result was a collection of 300 agri-food products, published in a book and on CD in 2001. Although the collection of products went on, the Ministry decided in 2010 to register a HÍR trademark with the Hungarian Office of Intellectual Property. Individual producers, producer groups and organizations, municipalities may apply for the HÍR trademark by presenting in the application the special and traditional characteristics of the product which are connected to a geographical region or area. By the end of 2021, 184 products of 95 applicants received the authorization for the use of the logo. The groups of the protected products are also widely promoted at national and local fairs, exhibitions, in the wholesale chains, in the media. The aim is to increase consumer awareness and understanding of the scheme and of the logo.

The HÍR Program is also considered as a tool to prepare producers for the application of EU GI quality schemes (PDO, PGI, TSG). By the end of 2021 28 Hungarian agricultural and food products, 38 wine names and 12 alcoholic drinks enjoyed EU protection. These products can be found in the eAmrosia list of the EU. Out of the 78 products 14 have received EU protection in 2021 and there are signs that interest for EU protection continues in the next years.

There is also another trademark and logo, which is worth to mention, because it aims to maintain traditional production methods and production characteristics, connected to certain regions of Hungary. This initiative is called Regional Farmer (Tájgazda). These production methods are often organic, producing healthy and safe food:

- The new CAP is convinced that all the measures for improving quality of products and of companies, environment-friendliness and sustainability can only be realized, if every national Strategy Plan has a strong axis for research and education, for knowledge transfer. Farmers and company employees must be devoted to lifelong learn-

ing and institutions with well trained teachers have to provide them with high level professional training. HNC for EOQ has a long experience in this. It is accredited in Hungary for trainings and to provide diplomas on quality management and is in contact with several other institutions and faculties, to share its knowledge. Every year HNC for EOQ organizes the highly visited and appreciated conference on „Quality Management in the Food Industry” in the city of Szeged, in the year 2021 already the 18th time.

6. THE EFFECTS OF THE PANDEMIC

COVID-19 reached Hungary mid-March 2020. In the evening of March 15, it was still me, who hesitated to attend a meeting with a greater group of friends and March 16 an opening of an exhibition was officially canceled.

The Government reacted fast in the interest of the health of population: public events were prohibited. Shops, restaurants, cafes were closed, only food stores and pharmacies could stay open, schools were closed, on working places everywhere where possible, home office was introduced. Masks were obligatory everywhere. In food stores there was a special time determined, when only elderly people could go for shopping.

These measures resulted in a global change in the buying habits in general and also for food, although food has to be consumed every day. In their purchases people concentrated more on basic food and foodstuffs of longer shelf life, demand for specialties especially for high-cost products reduced. Consumption in restaurants nearly disappeared and the lack of wedding ceremonies and friendly gatherings reduced the consumption of drinks, of alcohol.

Due to the well-organized activity of wholesale and retail trade, in Hungary there was no shortage in any food product (except for yeast for a few days). Anyhow there were substantial changes in the buying habits of people, which had an effect on food quality, and on food quality policy of the companies as well. People were spending less time in average in the shops; they preferred small retail shops to the big ones, because these were considered safer. Because of the shorter time and smaller shops people have preferred already well-known products, rather than looking for and trying unknown specialties. Demand increased also for safe and healthy products, and the source in the opinion of many consumers was the local product. The Hungarian Government introduced a campaign for buying local products partly for

their freshness and healthiness, partly to help domestic economy. Online purchasing of food – including ready-cooked dishes – rocketed and competition characterized this segment as well. As a consequence, suppliers had to ensure fair and reliable quality for their products not to lose the confidence of the consumers. In case of online delivery, consumers could not make their choice among the products of the same category (e.g. carrot, cauliflower, apple, piece of bread) like in a market-hall or supermarket, so they had to rely on quality delivered by the supplier. Many people – especially younger ones – who lost their job in hotels, restaurants or other pandemic-hit sectors found activity and income in the home-delivery of agri-food products. The retail traders and the restaurants reacted not only by organizing the home-delivery of food but also by developing digital applications, online shopping-lists, web shops.

The pandemic situation restricted the movement of people, of working force. In many countries of Europe both in 2020 and in 2021 there was lack of seasonal working force, especially for fruit and vegetable harvesting. As a result of production and supply was restricted, being one of the reasons for food price increase and of general inflation.

In Summer 2020 and 2021 the pandemic's effects were lower, many restrictions became looser or were lifted. In Winter of 2020/2021 restrictions had to be introduced again, still from January 2021 vaccination started in Hungary and by Autumn 2021 – although the number of infected people increased again – because of the high level of vaccinated (by the 1., 2. and from August even 3. vaccination) population, restrictions affecting public events were/are more moderated, than in the previous year. Restaurants, hotels, sport events are open to visit, domestic and most tourist destinations are free to visit – with vaccination certificate – and consumption pattern widely returned to the pre-Covid situation.

7. CONCLUSION

In recent months newer and newer variations of the corona virus appeared world-wide and also in Hungary, new waves of the pandemic are reaching the countries. There is hope that by spring the Pandemic ebbs or disappears. We have to draw the conclusions for a more resilient and sustainable agri-food production and consumption pattern, for a comprehensive quality policy by governments and producers, for demand for healthy and safe food by the consumers. The new CAP and the national Strategic Plans started the preparation of several goals into this direction.

Sažetak:

STRATEGIJE RAZVOJA KVALITETE VEZANO UZ NOVU ZAJEDNIČKU POLJOPRIVREDNU POLITIKU EU I PANDEMIJU COVID-19

S povećanjem prihoda svjetske populacije, sve je veća potražnja za kvalitetnim proizvodima. Kretanje kvalitete poljoprivredno-prehrambenih proizvoda nije stabilno. Mijenja se s vremenom, skupinama ljudi, tehnološkim razvojem, promjenama u društvenom okruženju. Po mišljenju potrošača, osim kvalitete samih proizvoda, još je jedan faktor bitan za njihovu odluku o kupnji, a to su povezane usluge, poput pakiranja, dostave, ponašanje (ljubaznost) prodavača. Dva značajna društvena utjecaja u posljednje vrijeme na percepciju kvalitete su svjetska pandemija COVID-19 i posebno u Europi – nova Zajednička poljoprivredna politika (CAP) za razdoblje 2023.-27. U ovom radu autori nastoje analizirati karakteristične faktore reakciju svijeta na ove izazove, s težištem na primjeru Mađarske.

Ključne riječi: kvaliteta, Zajednička poljoprivredna politika, strategije razvoja kvalitete.

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3. Commission Communicate in 210/C/341/04, EU best practice guidelines for voluntary certification schemes for agricultural products and foodstuffs, December 16th, 2010.
4. EC Communication on agriculture product quality policy, COM (2009)234 final, May 28th 2009.
5. Evaluation of GIs and TSGs protected in the EU, European Commission, Brussels, December 20th 2021.
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**OPTIMIZACIJA PROIZVODNJE U
METALOPRERAĐIVAČKOJ INDUSTRIJI
PRIMJENOM LINEARNOG PROGRAMIRANJA**

PRODUCTION OPTIMIZATION IN THE
METAL PROCESSING INDUSTRY BY USING LINEAR
PROGRAMMING

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SAŽETAK

Cilj ovog rada je izrada modela optimizacije proizvodnje u području metaloprerađivačke industrije. U prvom koraku istraživanja prikupljeni su podaci o poslovanju poduzeća i napravljena je analiza kapaciteta strojeva, sirovina i rada zaposlenika za izradu standardnih dijelova u proizvodnji transformacijskih kotlova. Istraživanje je

nastavljeno primjenom metode linearnog programiranja što je dovelo do saznanja da analizirani kapaciteti nisu u potpunosti iskorišteni. Daljnjim razmatranjem se utvrdilo kako je potrebno promijeniti proizvodni proces da bi se postigla optimalna proizvodnja dijelova, a time i maksimizirao ukupan prihod poduzeća. Nakon promjene parametara proizvodnog procesa dobiven je novi model linearnog programiranja koji u konačnici omogućuje planiranje optimalne proizvodnje poduzeća i povećanje njegove profitabilnosti.

Ključne riječi: optimizacija proizvodnje, linearno programiranje, simpleks metoda.

1. UVOD

Linearno programiranje matematička je metoda za optimizaciju i najčešće primjenjivana metoda operacijskih istraživanja. Modeli linearnog programiranja karakterizirani su linearnim jednadžbama i nejednadžbama. Linearno programiranje sastoji se od optimizacije zadane linearne funkcije čije varijable zadovoljavaju sustav linearnih jednadžbi i nejednadžbi.^{1,2} Funkcija cilja je ona linearna funkcija koja se optimizira. Dakle, linearno programiranje je matematička analiza problema gdje se traži maksimum odnosno minimum linearne funkcije sa zadanim ograničenjima. Standardni problem linearnog programiranja temelji se na pretpostavci o linearnosti. Naime, u modelima linearnog programiranja funkcija cilja kao i ograničenja linearne su funkcije. Pod pretpostavkom djeljivosti u modelu linearnog programiranja, svaka se varijabla može izraziti bilo kojim realnim brojem, ne nužno cijelim brojem. Konačno, pretpostavka izvjesnosti pretpostavlja da su svi parametri modela linearnog programiranja poznate konstante.^{3,4}

Ovaj rad strukturiran je na sljedeći način: nakon uvodnog poglavlja dan je pregled relevantne literature primjene linearnog programiranja. U trećem poglavlju opisan je standardni oblik problema linearnog programiranja za maksimum. Četvrto poglavlje prikazuje postizanje optimizacije proizvodnje u metaloprerađivačkoj industriji primjermom linearnog programiranja, dok posljednje poglavlje sadrži zaključak istraživanja.

¹ Dražen Barković, *Operacijska istraživanja*, Ekonomski fakultet, Osijek, 2001.

² Hamdy A. Taha, *Operations Research: An Introduction*, 10th edition. Pearson, 2017.

³ George B. Dantzig, Mukund Thapa, *Linear Programming I*, Springer-Verlag, New York, 1997.

⁴ Frederick S. Hillier, Gerald J. Lieberman, *Introduction to Operations Research*, 7ed., McGraw-Hill, 2001.

2. PODRUČJA PRIMJENE LINEARNOG PROGRAMIRANJA

Najčešći oblik primjene linearnog programiranja uključuje opći problem raspodjele resursa na određene aktivnosti na optimalni način. Eisel i Sandblom⁵ opisuju primjere iz svakodnevnog života koji se svode na problem linearnog programiranja. Tako se osnovna ideja dijetalnog problema temelji na odabiru one količine hrane koja udovoljava dnevnim prehrambenim potrebama uz minimalne troškove. Problem optimalnog rezanja (engl. Cutting Stock Problem) u najjednostavnijem obliku sastoji se od rezanja materijala dostupnih u određenim oblicima i veličinama u željene oblike i veličine uz minimalne troškove. Tehnike linearnog programiranja inkorporirane su u industriji rezanja kako bi se smanjio broj rolnih zaliha⁶ te minimizirali planovi rezanja i planovi s malim brojem uzoraka rezanja.⁷ Problem određivanja optimalnog rasporeda zaposlenika koji rade u smjenama, npr. vozači u javnom gradskom prijevozu⁸, raspored smjena fizioterapeuta u klinici⁹, minimiziranje ukupnih bolničkih troškova i maksimiziranje preferencija medicinskih sestara¹⁰ temeljeni su na modelima linearnog programiranja.

Analiza omeđivanja podataka (engl. Data Envelopment Analysis, DEA) primjena je linearnog programiranja koja se bavi usporedbom različitih jedinica za donošenje odluka, poput podružnica lanca brze hrane, usporedivih regionalnih zdravstvenih klinika, autosalona koji prodaju istu marku i slično. DEA je snažna matematička metoda koja koristi linearno programiranje za određivanje relativne učinkovitosti skupa funkcionalno sličnih jedinica za do-

⁵ H. A. Eisel, Carl Louis, Sandblom, *Linear Programming and its Applications*, Springer-Verlag Berlin Heidelberg, 2007.

⁶ Shunji Umetani, Mutsunori Yagiura, Toshihide Ibaraki, „One-Dimensional Cutting Stock Problem with a Given Number of Setups: A Hybrid Approach of Metaheuristics and Linear Programming“, *J Math Model Algor*, Vol. 5, 43-64, 2006. <https://doi.org/10.1007/s10852-005-9031-0>

⁷ Heinz Foerster, G. Wäscher, „Pattern reduction in one-dimensional cutting stock problems“, *International Journal of Production Research*, Vol. 38, 2000, pp. 1657–1676.

⁸ S. Rama, S. Srividya, Bellatti. Deepa, „A Linear Programming approach for optimal scheduling of workers in a Transport Corporation“, *International Journal of Engineering Trends and Technology (IJETT)*, Vol. 45, No. 10, 2017, pp. 482-487.

⁹ Juan Pablo Orejuela, Diana Andrea Peña, Neptali Bustamante, „Modeling the labor scheduling problem considering wellbeing for the clinic’s employees“, *Ingeniería y competitividad*, Vol. 16, No. 1, 2014.

¹⁰ Ahmed Ali El Adoly, Mohamed Gheith, Nashat Fors, „A new formulation and solution for the nurse scheduling problem: A case study in Egypt“, *Alexandria Engineering Journal*, Vol. 57, No. 4, 2018, pp. 2289-2298.

nošenje odluka.¹¹ Primarni elementi u DEA jesu skup jedinica za donošenje odluka, zajedno s njihovim izmjerenim inputima i outputima. Svrha DEA je utvrditi koje od jedinica za donošenje odluka učinkovito koriste svoje inpute, a koje ne.¹² Färe i ostali¹³ su pokazali kako je dijetalni problem, klasični problem linearnog programiranja, povezan s DEA te demonstrirali postupak za određivanje cijena učinkovitih jedinica za donošenje odluka.

Za rješavanje problema mješavine sastojaka (eng. Blending problems) koji uključuju miješanje nekoliko resursa ili materijala kako bi se stvorili drugi proizvodi koji odgovaraju potražnji, Mutangi i ostali¹⁴ te Li i ostali¹⁵ primijenili su metode linearnog programiranja. Transportni problem kojim se određuje optimalan plan transporta sredstava iz ishodišta do odredišta i to najčešće problem minimalnih troškova prijevoza neke robe analizirali su Ghazali i ostali¹⁶, Khan¹⁷, Khafajy.¹⁸

¹¹ Saber Saati, Adel Hatami-Marbini, Madjid Tavana, „Data envelopment analysis: an efficient duo linear programming approach“, *Int. J. Productivity and Quality Management*, Vol. 7, No. 1, 2011, pp. 90-103.

¹² Kenneth Baker, *Linear Programming: Data Envelopment Analysis*. In book: Optimization Modeling with Spreadsheets, Second Edition, pp.175-210.

¹³ Rolf Färe, Shavna Grosskopf, Giannis Karagiannis, Dimitris Margaritis, „Data envelopment analysis and its related linear programming models“, *Annals of Operations Research*, Vol. 250, 2015, 37-43.

¹⁴ T. Mutangi, Lungile Nyanga, AF van der Merwe, A. F., T. C. Chikowore, Givemore Kanyemba, „A linear programming model for blending“, *SAIIE25 Proceedings*, Stellenbosch, South Africa, 2013.

¹⁵ Xiang Li, Mohammad Reza Bonyadi, Zbigniew Michalewicz, Luigi Barone, „A Hybrid Evolutionary Algorithm for Wheat Blending Problem“, *The Scientific World Journal*, 2014. <https://doi.org/10.1155/2014/967254>.

¹⁶ Zulkipli Ghazali, Mohd Amin Abd Majid, Mohd Shazwani, „Optimal Solution of Transportation Problem Using Linear Programming: A Case of a Malaysian Trading Company“, *Journal of Applied Sciences*, Vol. 12, 2012. 2430-2435.

¹⁷ Muztoba Ahmad Khan, „Transportation Cost Optimization Using Linear Programming“, International Conference on Mechanical, Industrial and Energy Engineering, Khulna, Bangladesh, 2014.

¹⁸ Zainab AL Khafajy, „Application The Linear Programming According to Transportation Problem on Real Dana“, *International Journal of Scientific & Technology Research*, Vol. 8, No. 1, 2019, pp. 100-102.

3. STANDARDNI OBLIK PROBLEMA LINEARNOG PROGRAMIRANJA ZA MAKSIMUM

Problem linearnog programiranja je specifičan slučaj problema matematičkog programiranja u kojem je funkcija cilja linearna, a ograničenja su izražena u obliku linearnih jednadžbi i/ili nejednadžbi. Standardni oblik problema linearnog programiranja u kojem se maksimizira funkcija cilja može se formulirati na sljedeći način:¹⁹

$$\max z(x_1, x_2, \dots, x_n) = c_1x_1 + c_2x_2 + \dots + c_nx_n \quad (1)$$

uz uvjet

$$\begin{aligned} a_{11}x_1 + a_{12}x_2 + \dots + a_{1n}x_n &\leq b_1 \\ a_{21}x_1 + a_{22}x_2 + \dots + a_{2n}x_n &\leq b_2 \\ &\vdots \\ a_{m1}x_1 + a_{m2}x_2 + \dots + a_{mn}x_n &\leq b_m \end{aligned} \quad (2)$$

Koeficijenti $c_j, j = 1, 2, \dots, n$ su koeficijenti funkcije cilja $z(x_1, x_2, \dots, x_n)$ koja se maksimizira, dok su $x_j, j = 1, 2, \dots, n$ strukturne varijable. Ograničenja (2) su linearne nejednadžbe s koeficijentima $a_{ij}, i = 1, 2, \dots, m, j = 1, 2, \dots, n$ te koeficijentima $b_i, i = 1, 2, \dots, m$. Izrazom (3) prikazani su uvjeti nenegativnosti strukturnih varijabli.

Za rješavanje kompleksnih problema linearnog programiranja koji uključuju više od dvije varijable najčešće se koristi simpleks metoda. Simpleks metoda je opća, iterativna i konačna metoda za rješavanje problema linearnog programiranja.²⁰ Rješava bilo koji problem linearnog programiranja, provodi se kroz niz koraka, od bazičnog rješenja pa sve do optimalnog rješenja, ako ono postoji, te rješava problem linearnog programiranja u konačnom broju koraka. Rješavanje problema linearnog programiranja simpleks metodom započinje nekim bazičnim rješenjem i na temelju kriterija optimalnosti ispituje se je li to rješenje optimalno. Ako je dobiveno rješenje optimalno, postupak je gotov, ako nije, pronalazi se novo bazično rješenje. Taj postupak se ponavlja dok se ne dobije optimalno rješenje. Detaljnije o simpleks metodi i simpleks postupku za problem maksimuma vidjeti u Babić²¹, Neralić²², Denardo.²³

¹⁹ Robert J. Vanderbei, *Linear Programming: Foundations and Extensions*, 4th ed. Springer, 2014.

²⁰ Luka Neralić, *Uvod u matematičko programiranje*, Element, Zagreb, 2003.

²¹ Zoran Babić, *Linearno programiranje*, Sveučilište u Splitu, Ekonomski fakultet, Split, 2010.

²² Luka Neralić, *Uvod u matematičko programiranje*, Element, Zagreb, 2003.

²³ Eric V. Denardo, *Linear Programming and Generalizations: A Problem-based Introduction with Spreadsheets*, Springer, 2011.

U linearnom programiranju od velikog su značaja analize nastavne na optimalno rješenje. Analiza osjetljivosti istražuje koliko mogu varirati početni podaci modela bez da se promijeni optimalno rješenja²⁴. Razlikuju se sljedeće analize osjetljivosti: promjene u ograničenjima, promjene u funkciji cilja, promjene u strukturnim koeficijentima, dodavanje novih varijabli i dodavanje novih ograničenja.²⁵ U ovom je radu korištena analiza osjetljivosti promijene u strukturnim koeficijentima modela kako bi se iz originalnog modela stvarnog sustava dobio transformirani model koji daje poboljšano rješenje.

4. OPTIMIZACIJA PROIZVODNJE U METALOPRERAĐIVAČKOJ INDUSTRIJI PRIMJENOM LINEARNOG PROGRAMIRANJA

Osnovni cilj svakog poduzeća je osigurati stabilan rast i likvidnost koja osigurava redovno funkcioniranje na svim razinama. Da bi se ostvarili postavljeni ciljevi jedan od preduvjeta u proizvodnim industrijama je optimizacija proizvodnje, odnosno svođenje troškova na minimum uz zadržavanje adekvatne razine kvalitete. Optimizacija proizvodnje u metaloprerađivačkoj industriji primjermom linearnog programiranja prikazana je u nastavku rada na primjeru poduzeća kojem je glavna djelatnost metaloprerađivačka proizvodnja i montaža čeličnih konstrukcija, transformatorskih kotlova, dijelova tračničkih vozila i opreme za tlačne posude.

4.1. Početni model linearnog programiranja za optimizaciju proizvodnje standardnih dijelova kod proizvodnje transformacijskih kotlova

Optimizacija je provedena za nekoliko odabranih proizvoda za što su prikupljeni relevantni podaci. Proizvodi koji su uzeti za analizu i postavljanje početnog modela standardnog problema linearnog programiranja jesu standardni dijelovi kod proizvodnje transformacijskih kotlova, odnosno PB-1, PB-2, PB-4 i PB-6. Prirubnice se mogu prodavati zasebno poduzećima koja također proizvode transformacijske kotlove, kao dio kooperacije. U nastavku rada opisani su proizvodi, odnosno koliko je i kojeg rada potrebno da bi se pojedini proizvod proizveo. PB-1 predstavlja proizvod 1, PB-2 predstavlja proizvod 2, PB-4 predstavlja proizvod 4 i PB-6 jest proizvod 6. Potrebno vrijeme, materijal i ograničenja prikazana su tabličnim prikazom za sva četiri proizvoda (Tablica 1).

²⁴ Hamdy A. Taha, *Operations Research: An Introduction*, 10th edition. Pearson, 2017.

²⁵ Slavko Dobrenić, *Operativno istraživanje*, Fakultet organizacije i informatike, Varaždin, 1978.

Tablica 1. Prikaz podataka za izgradnju modela linearnog programiranja

	PB-1 x_1	PB-2 x_2	PB-4 x_3	PB-6 x_4	OGRANIČENJA	MJERNA JEDINICA
RAD 1 – razrada tehn. dokumentacije	20	15	20	20	420	minuta
RAD 2 – crtanje u AUTOCAD-u	10	5	8	10	360	minuta
RAD 3 – rezanje lima na stroju	7	8	20	30	390	minuta
RAD 4 – tokarenje	10	20	50	50	420	minuta
RAD 5 – bušenje	10	15	60	70	390	minuta
RAD 6 – brušenje	10	0	0	0	320	minuta
RAD 7 – narezivanje navoja	15	20	0	40	300	minuta
RAD 8 – zaštita navoja	5	5	0	10	50	minuta
RAD 9 – pjeskaranje	4	20	10	10	320	minuta
RAD 10 – bojanje	15	20	25	25	300	minuta
MATERIJAL 1 – lim	5	13	16	25	1000	kilogram
MATERIJAL 2 – boja	0.5	1	2.5	2	800	kilogram

Izvor: Novak (2018, str. 28).

Na temelju podataka prikazanih u Tablici 1 postavljen je originalni oblik problema linearnog programiranja. Funkcija cilja i ograničenja:

$$\begin{aligned}
 Z &= 333x_1 + 866x_2 + 1066x_3 + 1665x_4 \rightarrow \max \\
 20x_1 + 15x_2 + 20x_3 + 20x_4 &\leq 420 \\
 10x_1 + 5x_2 + 8x_3 + 10x_4 &\leq 360 \\
 7x_1 + 8x_2 + 20x_3 + 30x_4 &\leq 390 \\
 10x_1 + 20x_2 + 50x_3 + 50x_4 &\leq 420 \\
 10x_1 + 15x_2 + 60x_3 + 70x_4 &\leq 390 \\
 10x_1 + 0x_2 + 0x_3 + 0x_4 &\leq 320 \\
 15x_1 + 20x_2 + 0x_3 + 40x_4 &\leq 300 \\
 5x_1 + 5x_2 + 0x_3 + 10x_4 &\leq 50 \\
 4x_1 + 20x_2 + 10x_3 + 10x_4 &\leq 320 \\
 15x_1 + 20x_2 + 25x_3 + 25x_4 &\leq 300 \\
 5x_1 + 13x_2 + 16x_3 + 25x_4 &\leq 1000 \\
 0.5x_1 + 1x_2 + 2.5x_3 + 2x_4 &\leq 800 \\
 x_1, x_2, x_3, x_4 &\geq 0
 \end{aligned}$$

Izvor: Novak (2018, str. 39-40).

Postavljeni problem rješavan je uz pomoć simpleks metode iterativnim postupkom. Nakon treće iteracije dobiveno je konačno optimalno rješenje originalnog problema. Za potrebe izračuna rješenja ovog problema korišten je „free“ alat Simplex method calculator (AtoZmath, 2018). Optimalno rješenje jest: , , , . Analizom dobivenih rezultata utvrđeno je da u potpunosti nisu iskorišteni kapaciteti strojeva, materijala te rada zaposlenika. Kapaciteti nisu iskorišteni za: Rad 1 – 190 minuta, Rad 2 – 278 minuta, Rad 3 – 230 minuta, Rad 4 – 20 minuta, Rad 6 – 320 minuta, Rad 7 – 100 minuta, Rad 9 – 80 minuta, Materijal 1 – 806 kilograma, Materijal 2 – 780 kilograma. Iz navedenih rezultata vidljivo je da bi za poduzeće bilo pogodno da optimizira proizvodnju uključivanjem neiskorištenih kapaciteta za što bi trebalo uložiti dodatne napore, tj. reorganizaciju postojećeg proizvodnog procesa. Podaci prikazani u Tablici 2 pokazuju da proizvođači proizvode ovim modelom, poduzeće zaradi ukupno 12,924.00 kuna.

Tablica 2. Rezultati originalnog oblika problema

Proizvod	Količina	Prihod	Ukupno = (količina * prihod)
	0	333.00	0.00
	10	866.00	8,660.00
	4	1,066.00	4,264.00
	0	1,665.00	0.00
UKUPNA VRIJEDNOST			12,924.00

Izvor: Novak (2018, str. 47).

U nastavku je prikazana analiza osjetljivosti te je ponuđeno rješenje kojim bi poduzeće moglo zaraditi više proizvođači uz optimalno iskorištenje do sada neiskorištenih kapaciteta.

4.2. Analiza osjetljivosti i transformacija modela za optimizaciju proizvodnje standardnih dijelova kod proizvodnje transformacijskih kotlova

Kako bi se poboljšalo dobiveno optimalno rješenje, izvršene su promjene u strukturnim koeficijentima modela. Za što realniju prilagodba i u skladu sa strukom, proveden je intervju s voditeljima pojedinih odjela proizvodnje, koji su prema svojem radnom iskustvu i znanju naveli na koji način bi se

pojedini parametri proizvodnje mogli korigirati te samim time ubrzati proces proizvodnje proizvoda. Prilagodba je izvršena samo na koeficijentima rada, dok su koeficijenti materijala ostali nepromijenjeni iz razloga što je navedena količina materijala za proizvodnju proizvoda neophodna. Kako bi se zornije prikazala prilagodba, u Tablici 3 dana je usporedba koeficijenata originalnog problema i koeficijenata promijenjenog problema.

Tablica 3. Usporedba originalnih i promijenjenih koeficijenata

originalni koeficijenti problema	promijenjeni koeficijenti problema
$20x_1 + 15x_2 + 20x_3 + 20x_4 \leq 420$	$17x_1 + 13x_2 + 16x_3 + 16x_4 \leq 420$
$10x_1 + 5x_2 + 8x_3 + 10x_4 \leq 360$	$8x_1 + 4x_2 + 6x_3 + 8x_4 \leq 360$
$7x_1 + 8x_2 + 20x_3 + 30x_4 \leq 390$	$7x_1 + 8x_2 + 20x_3 + 30x_4 \leq 390$
$10x_1 + 20x_2 + 50x_3 + 50x_4 \leq 420$	$10x_1 + 20x_2 + 50x_3 + 50x_4 \leq 420$
$10x_1 + 15x_2 + 60x_3 + 70x_4 \leq 390$	$8x_1 + 12x_2 + 50x_3 + 55x_4 \leq 390$
$10x_1 + 0x_2 + 0x_3 + 0x_4 \leq 320$	$8x_1 + 0x_2 + 0x_3 + 0x_4 \leq 320$
$15x_1 + 20x_2 + 0x_3 + 40x_4 \leq 300$	$15x_1 + 20x_2 + 0x_3 + 40x_4 \leq 300$
$5x_1 + 5x_2 + 0x_3 + 10x_4 \leq 50$	$4x_1 + 4x_2 + 0x_3 + 8x_4 \leq 50$
$4x_1 + 20x_2 + 10x_3 + 10x_4 \leq 320$	$3x_1 + 16x_2 + 8x_3 + 8x_4 \leq 320$
$15x_1 + 20x_2 + 25x_3 + 25x_4 \leq 300$	$13x_1 + 17x_2 + 21x_3 + 21x_4 \leq 300$
$5x_1 + 13x_2 + 16x_3 + 25x_4 \leq 1000$	$5x_1 + 13x_2 + 16x_3 + 25x_4 \leq 1000$
$0.5x_1 + 1x_2 + 2.5x_3 + 2x_4 \leq 800$	$0.5x_1 + 1x_2 + 2.5x_3 + 2x_4 \leq 800$
$x_1, x_2, x_3, x_4 \geq 0$	$x_1, x_2, x_3, x_4 \geq 0$

Izvor: Novak (2018, str. 48).

Na temelju podataka dobivenih od voditelja pojedinih odjela proizvodnje postavljen je transformirani oblik problema linearnog programiranja. Funkcija cilja i ograničenja:

$$\begin{aligned}
 Z &= 333x_1 + 866x_2 + 1066x_3 + 1665x_4 \rightarrow \max \\
 17x_1 + 13x_2 + 16x_3 + 16x_4 &\leq 420 \\
 8x_1 + 4x_2 + 6x_3 + 8x_4 &\leq 360 \\
 7x_1 + 8x_2 + 20x_3 + 30x_4 &\leq 390 \\
 10x_1 + 20x_2 + 50x_3 + 50x_4 &\leq 420 \\
 8x_1 + 12x_2 + 50x_3 + 55x_4 &\leq 390 \\
 8x_1 + 0x_2 + 0x_3 + 0x_4 &\leq 320 \\
 15x_1 + 20x_2 + 0x_3 + 40x_4 &\leq 300 \\
 4x_1 + 4x_2 + 0x_3 + 8x_4 &\leq 50 \\
 3x_1 + 16x_2 + 8x_3 + 8x_4 &\leq 320
 \end{aligned}$$

$$\begin{aligned}
13x_1 + 17x_2 + 21x_3 + 21x_4 &\leq 300 \\
5x_1 + 13x_2 + 16x_3 + 25x_4 &\leq 1000 \\
0.5x_1 + 1x_2 + 2.5x_3 + 2x_4 &\leq 800 \\
x_1, x_2, x_3, x_4 &\geq 0
\end{aligned}$$

Izvor: Novak (2018, str. 48-49).

Korištenjem simpleks metode, provođenjem iterativnog postupka, nakon četvrte iteracije dobiveno je konačno optimalno rješenje transformiranog modela. Optimalno rješenje jest: , , , . Proizvođači proizvode korištenjem transformiranog modela, poduzeće zaradi ukupno 14,456.00 kuna (Tablica 4).

Tablica 4. Ukupna vrijednost poboljšanog modela

Naziv proizvoda	Količina	Prihod	Ukupno = (količina * prihod)
PB-1 ()	0	333.00	0.00
PB-2 ()	13	866.00	11,258.00
PB-4 ()	3	1,066.00	3,198.00
PB-6 ()	0	1,665.00	0.00
UKUPNA VRIJEDNOST			14,456.00

Izvor: Novak (2018, str. 53).

Za jasniji prikaz rješenja originalnog i transformiranog modela Tablicom 5 dana je usporedba.

Tablica 5. Usporedba modela

Naziv proizvoda	ORIGINALNI PROBLEM			PROMJENJEN MODEL		
	Količina	Prihod	Ukupno	Količina	Prihod	Ukupno
PB-1	0	333.00	0	0	333.00	0.00
PB-2	10	866.00	8,660.00	13	866.00	11,258.00
PB-4	4	1,066.00	4,264.00	3	1,066.00	3,198.00
PB-6	0	1,665.00	0.00	0	1,665.00	0.00
UKUPNO			12,924.00			14,456.00

Izvor: Novak (2018, str. 53).

Kako je vidljivo iz Tablice 5, rješenje koje je dobiveno transformiranim modelom donosi poduzeću veću zaradu od postojećeg modela prema kojem poduzeće trenutno posluje. Razlika u zaradi između postojećeg modela proizvodnje i modela proizvodnje dobivenog promjenom koeficijenta jest 1,532.00 kune. S obzirom da ova prilagodba ne zahtijeva neke velike promijene, njezino uvođenje dugoročno bi poduzeću mogle donijeti veće uštede odnosno znatno veću zaradu, posebice ako razmišlja u budućnosti proširiti svoju proizvodnju.

5. ZAKLJUČAK

Linearno programiranje je najčešće primjenjivana metoda operacijskih istraživanja za optimizaciju sustava uzimajući u obzir zadana ograničenja. Modeli linearnog programiranja definirani su linearnom funkcijom cilja koja se maksimizira ili minimizira te skupom ograničenja izraženih u obliku linearnih jednadžbi ili nejednadžbi. U ovom je radu izrađen model linearnog programiranja za maksimizaciju ukupnog prihoda poduzeća u području metaloprađivačke industrije. Istraživanje je započelo prikupljanjem podataka o poslovanju i proizvodnji poduzeća relevantnih za izradu modela linearnog programiranja. Nakon što je napravljena analiza postojećeg modela proizvodnje, izradom modela linearnog programiranja i rješavanjem problema uz pomoć simpleks metode zaključeno je da proizvodni kapaciteti poduzeća nisu iskorišteni u potpunosti. S ciljem postizanja optimalne proizvodnje standardnih dijelova u proizvodnji transformacijskih kotlova te maksimizacije profita poduzeća promijenjeni su ulazni podaci na temelju intervjua s voditeljima pojedinih odjela poduzeća. Provođenjem analize osjetljivosti promjenom ulaznih parametara utvrđeno je da bi poduzeće trebalo reorganizirati proizvodni program kako bi se raspoloživi proizvodni kapaciteti u potpunosti iskoristili i povećala zarada poduzeća. Novi model linearnog programiranja omogućuje optimalniji proizvodni program poduzeća, povećanje profitabilnosti, a time i konkurentnost za opstanak na tržištu.

Abstract:

PRODUCTION OPTIMIZATION IN THE METAL
PROCESSING INDUSTRY BY USING LINEAR PROGRAMMING

The aim of this paper is to develop a model of production optimization in the field of metal processing industry. First, data on the company's operations were collected and an analysis of the machinery, raw materials and labor capacity for the production of standard parts in the production of transformer boilers was conducted. The research continued by applying the method of linear programming, which led to the finding that the analyzed capacities were not fully utilized. Further consideration determined that it is necessary to change the production process in order to achieve optimal production, and thus to maximize the total revenue of the company. After parameters of the production process changing, a new model of linear programming was obtained, which enables the optimal production planning and which increase its profitability.

Key words: production optimization, linear programming, simplex method.

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POSTUPAK OCJENJIVANJA I PROVJERE STALNOSTI SVOJSTAVA INOVATIVNOG GRAĐEVNOG PROIZVODA

ASSESSMENT AND VERIFICATION OF
CONSTANCY OF PERFORMANCE OF INNOVATIVE
CONSTRUCTION PRODUCTS

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SAŽETAK:

Postizanje klimatske neutralnosti i održivog kružnog gospodarstva s niskim emisijama ugljika moguće je ostvariti jedino sinergijom djelovanja između različitih sektora. Energetski sektor i dalje predstavlja najveći izvor emisija stakleničkih plinova pri čemu doprinosi s više od tri četvrtine ukupnih emisija. S druge strane, promicanje upotrebe energije iz obnovljivih izvora dovelo je do povećanog korištenja drvne biomase kao obnovljivog izvora energije, no unatoč njezinom velikom potencijalu, generiraju se značajne količine otpadnog pepela drvne biomase (PDB). Budući da je razvoj sektora gospodarenja otpadom usmjeren na smanjenje nastajanja otpada, povećanje recikliranja i uporabu otpada, pri čemu će važnu ulogu imati ekološki dizajn proizvoda, potrebno je spriječiti neprimjereno odlaganje PDB-a. Prema načelima

kružne ekonomije postoji veliki potencijal razvoja sinergije između energetske i građevinskog sektora. Naime, brojna istraživanja pokazala su učinkovitu primjenu PDB-a kao djelomične zamjene cementa i/ili sitnog agregata u industriji cementa i betona. Cilj je ovog istraživanja pronaći mogućnosti uporabe PDB-a u proizvodnji građevinskih proizvoda u kojima se PDB primjenjuje kao zamjena cementa ili sitnog agregata. U radu je prikazan postupak ocjenjivanja i provjere stalnosti svojstava inovativnog građevnog proizvoda s otpadnim pepelom drvene biomase – vibroprešanog betonskog rubnjaka, u svrhu izdavanja izjave o svojstvima i stavljanja proizvoda na tržište.

Ključne riječi: pepeo drvene biomase, građevni proizvod, vibroprešani betonski rubnjak, tvornička kontrola proizvodnje, ocjenjivanje i provjera stalnosti svojstava, izjava o svojstvima.

1. UVOD

Klimatske promjene uzrokovane ljudskim djelovanjem uzrokuju ozbiljne prirodne katastrofe poput toplinskih valova, obilnih oborina, suša i tropske ciklone.¹ Europska komisija, osviještena problematikom koja prijete cjelokupnom čovječanstvu, donosi paket prijedloga „Spremni za 55%“, usmjerenih na transformaciju gospodarstva, društva i industrije postavljajući obvezujući cilj postizanja klimatske neutralnosti do 2050. odnosno smanjenje emisija stakleničkih plinova za 55% do 2030.² U ostvarivanju toga cilja, veliku ulogu ima bioenergija, odnosno energane na krutu i plinovitu biomasu. Međutim, tijekom izgaranja drvene biomase nastaju značajne količine otpadnog PDB-a, čije nepropisno odlaganje može utjecati na zagađenje okoliša i ugrožavanje zdravlja ljudi. Budući da je razvoj sektora gospodarenja otpadom usmjeren na smanjenje nastajanja otpada, povećanje recikliranja i uporabu otpada, potrebno je spriječiti neprimjereno odlaganje PDB-a. U ovome radu prikazan je primjer sinergije između energetske i građevinskog sektora, upotrebom otpadnog PDB-a u proizvodnji građevnog proizvoda u kojima je PDB korišten kao zamjena cementa ili sitnog agregata te postupci koje je potrebno provoditi da bi proizvod bio stavljen na tržište.

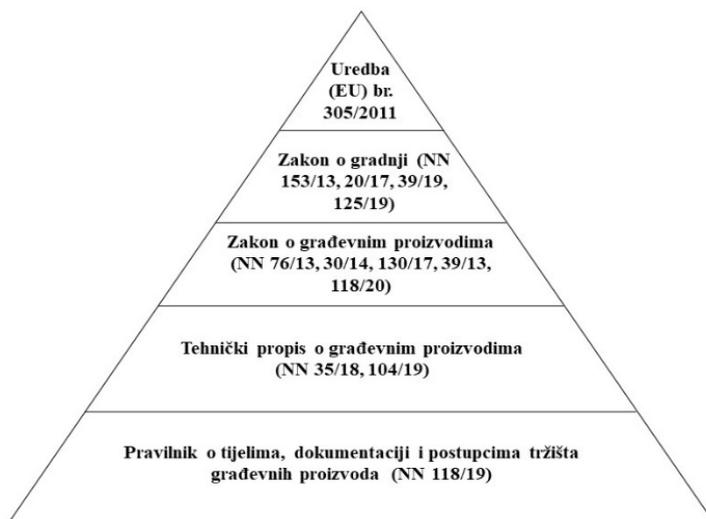
¹ IPCC, “Global Warming of 1,5°C. An IPCC Special Report on the impacts of global warming of 1,5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty“, 2018.

² European Commission, “European Green Deal: Commission proposes transformation of EU economy and society to meet climate ambitions“, Brussels, 2021.

2. ZAKONODAVSTVO U RH

Pristupanjem Republike Hrvatske (RH) Europskoj Uniji (EU) podrazumijevalo je i ujednačavanje pravnih i upravnih propisa zemalja članica o građevnim proizvodima s važećom regulativom. Na slici 1. prikazana je hijerarhija važeće zakonske regulative u RH koja propisuje načine ocjenjivanja kvalitete građevnih proizvoda te sve ostale postupke gradnje.

Slika 1. Zakonodavstvo stavljanja na tržište građevnih proizvoda u RH



Izvor: Izvorno autorsko.

Pri samom vrhu nalazi se Uredba (EU) o građevnim proizvodima br. 305/2011³, utemeljena na Direktivi (EU) o građevnim proizvodima 89/106⁴, kojom se propisuju uvjeti stavljanja na tržište ili stavljanja na raspolaganje na tržište građevnih proizvoda utvrđivanjem usklađenih pravila o načinu izra-

³ European Parliament and the Council, „Regulation (EU) No. 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC, *Official Journal of the European Union*, pp. 5-43, 2011.

⁴ The Council of the European Communities, Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products (89/106/EEC), *Official Journal of the European Union*, pp. 12-26, 1988.

žavanja svojstava građevnih proizvoda u odnosu na njihove bitne značajke i uporabu oznake CE na navedenim proizvodima. Uredba (EU) 305/11 odnosi se na proizvode u usklađenom području koje je objašnjeno u sljedećem poglavlju³.

Ovisno o svojoj namjeni, svaka građevina mora biti projektirana i izgrađena na način da tijekom svog trajanja ispunjava temeljne zahtjeve za građevinu prema kako je definirano u Zakonu o gradnji. Prema članku 54. pravna osoba u svojstvu izvođača dužna je osigurati dokaze o sukladnosti ugrađenih proizvoda u odnosu na njihove bitne značajke. Prema članku 8. ovog Zakona, temeljni zahtjevi za građevinu su: 1. Mehanička otpornost i stabilnost; 2. Sigurnost u slučaju požara; 3. Higijena, zdravlje i okoliš; 4. Sigurnost i pristupačnost tijekom uporabe; 5. Zaštita od buke; 6. Gospodarenje energijom i očuvanje topline te 7. Održiva uporaba prirodnih izvora⁵.

Zakonom o građevnim proizvodima uređuju se sustavi ocjenjivanja i provjere stalnosti svojstva te radnje koje provode proizvođač i prijavljena odnosno odobrena tijela u tim sustavima. Osim toga, zakonom se uređuju zahtjevi za prijavljena i odobrena tijela i njihove dužnosti te imenovanje tijela za tehničko ocjenjivanje, što se odnosi na proizvode u neusklađenom (neharmoniziranome) području kao što je objašnjeno u sljedećem poglavlju⁶.

U okviru ispunjavanja temeljnih zahtjeva za građevinu, Tehničkim propisom o građevnim proizvodima⁷ propisuju se bitne značajke i svojstva građevnih proizvoda, uporabljivost te drugi zahtjevi za građevne proizvode namijenjene ugradnji u građevine.

Pravilnikom o tijelima, dokumentaciji i postupcima tržišta⁸ propisuju se zahtjevi za odobreno tijelo i hrvatsko tijelo za tehničko ocjenjivanje, način dokazivanja njihove sposobnosti i dokumentacija koju moraju priložiti prilikom prijave zahtjeva. Također, propisuje radnje ocjenjivanja i provjere stalnosti svojstava građevnih proizvoda, sadržaj izjave o svojstvima te označavanje proizvoda u neusklađenom području.

³ Zakon o gradnji, Narodne novine, (153/13, 20/17, 39/19, 125/19), 2019.

⁶ Zakon o građevnim proizvodima, Narodne novine (76/13, 30/14, 130/17, 39/13, 118/20), 2020.

⁷ Tehnički propis o građevnim proizvodima, Narodne novine (33/10, 81/10, 146/10, 81/11, 100/11, 130/12), 2018.

⁸ Pravilnik o tijelima, dokumentaciji i postupcima tržišta, Narodne novine (118/19), 2019.

3. POSTUPAK OCJENJIVANJA I PROVJERE STALNOSTI SVOJSTAVA GRAĐEVNIH PROIZVODA

Prije stavljanja građevnog proizvoda na tržište RH i EU, proizvođač i prijavljeno, odnosno odobreno tijelo ili tijela za tehničko ocjenjivanje moraju provesti niz radnji ocjenjivanja i provjere stalnosti svojstava u skladu s važećom zakonskom regulativom, na temelju kojih proizvođač sastavlja izjavu o svojstvima te na proizvod stavlja propisanu oznaku (oznake „CE“ ili „C“).

Postupak ocjenjivanja i provjere stalnosti svojstava građevnih proizvoda provode 3 strane:

- 1. strana: gospodarski subjekti (proizvođač, uvoznik, distributer ili ovlašteni predstavnik);
- 2. strana: kupci i inspekcijsko tijelo;
- 3. strana: osigurava neovisnu potvrdu.

Tablica 1. Shema postupaka i tijela u postupku ocjenjivanja i provjere stalnosti svojstava građevnih proizvoda

USKLAĐENO PODRUČJE (CE)		NEUSKLAĐENO PODRUČJE (C)	
Uredba 305/2011		Zakon o građevnim proizvodima	
usklađena (harm.) eur. norma (hTS) usklađena eur. norma (hEN) eur. dokument za ocjenjivanje (EAD) eur. tehnička ocjena (ETA)		hrv. tehnička specifikacija (HTS) neusklađena hrv. norma (HRN) hrv. dokument za ocjenjivanje (HDO) hrv. tehnička ocjena (HTO)	
Građevni proizvodi USKLAĐENI s normama	Građevni proizvodi NEUSKLAĐENI s normama	Građevni proizvodi USKLAĐENI s normama	Građevni proizvodi NEUSKLAĐENI s normama
Prijavljeno tijelo (engl. Notified Body - NB)	Tijelo za tehničko ocjenjivanje (engl. Technical Assessment Body - TAB)	Odobreno tijelo (OT)	Hrvatsko tijelo za tehničko ocjenjivanje (HTTO)

<p><i>Podnositelj zahtjeva za NB (dokaz: dokument koji izdaje nacionalno akreditacijsko tijelo kojim se potvrđuje osposobljenost za provedbu zadaća treće strane) podnosi <u>zahtjev Upravnom tijelu</u> (Ministarstvo prostornoga uređenja, graditeljstva i imovine - MGiPU) koje <u>provjerava</u> ispunjenje zahtjeva iz čl. 43 Uredbe te <u>obavještava Eur. komisiju</u> i države članice EU. <i>Eur. komisija potvrđuje</i> podnesenu prijavu u skladu s čl. 48 Uredbe te <i>Podnositelj zahtjeva može obavljati zadaće treće strane</i>. NB mogu biti: tijelo za certificiranje proizvoda, tijelo za certificiranje kontrole tvorničke proizvodnje te laboratoriji za ocjenjivanje svojstava građevnih proizvoda.</i></p>	<p><i>Podnositelj zahtjeva za TAB (dokaz: dokument koji izdaje nacionalno akreditacijsko tijelo kojim se potvrđuje osposobljenost za provedbu zadaća treće strane) podnosi <u>zahtjev Upravnom tijelu</u> (MGiPU) za <u>imenovanje TAB-om i provedbu zadaća treće strane</u> te <u>izdavanja ETA</u> za jedno ili više područja proizvoda (Prilog IV. Uredbe). <i>Upravno tijelo provjerava</i> ispunjenje zahtjeva iz Priloga IV. Uredbe i čl. 30.-36. Pravilnika i <u>donosi rješenje</u> za provedbu ocjenjivanja i izdavanje ETA te <u>obavještava Eur. komisiju</u> i države članice EU koja <u>potvrđuje</u> podnesenu prijavu.</i></p>	<p><i>Podnositelj zahtjeva za OT (dokaz: dokument koji izdaje nacionalno akreditacijsko tijelo kojim se potvrđuje osposobljenost za provedbu zadaća treće strane) podnosi <u>zahtjev Upravnom tijelu</u> (MGiPU) za <u>provedbu zadaća treće strane</u>, koje provjerava ispunjenje zahtjeva iz čl. 14-19. Priloga I. Pravilnika te <u>donosi rješenje</u> da <i>Podnositelj zahtjeva može obavljati zadaće treće strane</i>. OT mogu biti: tijelo za certificiranje proizvoda, tijelo za certificiranje kontrole tvorničke proizvodnje te laboratoriji za ocjenjivanje svojstava građevnih proizvoda.</i></p>	<p><i>Podnositelj zahtjeva za HTO (dokaz: dokument koji izdaje nacionalno akreditacijsko tijelo kojim se potvrđuje osposobljenost za provedbu zadaća treće strane) podnosi <u>zahtjev Upravnom tijelu</u> (MGiPU) za <u>imenovanje HTO-om i provedbu zadaća treće strane</u> te <u>izdavanja HTO</u> za jedno ili više područja proizvoda (Prilog XII. Pravilnika). <i>Upravno tijelo provjerava</i> ispunjenje zahtjeva iz Priloga VI. i čl. 30.-36. Pravilnika i <u>donosi rješenje</u> za provedbu ocjenjivanja i izdavanje HTO.</i></p>
Certifikat stalnosti svojstava za sustave 1+,1	Europski dokument za ocjenjivanje (EAD)	Certifikat stalnosti svojstava za sustave 1+,1	Hrvatski dokument za ocjenjivanje (HDO)
Certifikat sukladnosti kontrole tvorničke proizvodnje	Europska tehnička ocjena (ETA)	Certifikat sukladnosti kontrole tvorničke proizvodnje	Hrvatska tehnička ocjena (HTO)
Proizvođač izdaje izjavu o svojstvima (oznaka "CE")		Proizvođač izdaje izjavu o svojstvima (oznaka "C")	

Izvor: Izvorno autorsko.

Proizvođač je dužan utvrditi nalazi li se njegov proizvod u usklađenom ili neusklađenom području, odnosno postoji li za njegov građevni proizvod usklađena norma te koji je sustav ocjenjivanja i provjere stalnosti potrebno provoditi. Usklađena norma ima dodatak ZA koji određuje sustav ocjenjiva-

nja i provjere stalnosti prema Uredbi (EU) 305/11, dok neusklađena norma nema taj dodatak te se sukladnost potvrđuje prema Zakonu o građevnim proizvodima. Nakon utvrđivanja, proizvođač angažira tijelo koje provodi zadaće 3. strane u postupku ocjenjivanja i provjere stalnosti svojstava (tablica 1.).

Tablica 2. Sustavi ocjenjivanja i provjere stalnosti svojstava³

SUSTAV OCJENJIVANJA	1+	1	2+	3	4
Kontrola tvorničke proizvodnje (engl. factory production control – FPC)	P	P	P	P	P
Daljnje ispitivanje uzoraka koje je uzeo proizvođač	P	P	P		
Ocjenjivanje svojstava	PT	PT	P	PT	P
Početni pregled (proizvodnog pogona i FPC-a)	PT	PT	PT		
Stalni nadzor, ocjenjivanje i vrednovanje FPC-a	PT	PT	PT		
Ispitivanje slučajnih uzoraka koje je uzelo prijavljeno tijelo	PT				
P – proizvođač; PT – prijavljeno tijelo					

Izvor: Europski Parlament i Vijeće Europske Unije, „Uredba (EU) br. 305/2011 Europskog Parlamenta i Vijeća od 9. ožujka 2011. o utvrđivanju usklađenih uvjeta za stavljanje na tržište građevnih proizvoda i stavljanju izvan snage Direktive Vijeća 89/160/EEZ, Službeni list Europske Unije, pp. 5-43, 2011.

Ocjenjivanje i provjera stalnosti svojstava građevnih proizvoda u odnosu na njihove bitne značajke mora se provoditi u skladu s pet sustava ocjenjivanja i provjere stalnosti građevnih proizvoda: Sustav 1+, Sustav 1, Sustav 2+, Sustav 3, Sustav 4 (tablica 2.).⁶ Sustavi ocjenjivanja i provjere stalnosti svojstava građevnih proizvoda definiraju zadaće proizvođača i prijavljenog odnosno tijela u postupku ocjenjivanja i provjere stalnosti građevnih proizvoda. Cilj ocjenjivanja građevnih proizvoda je dokazivanje sukladnosti izjavom o svojstvima³.

4. POSTUPAK OCJENJIVANJA I PROVJERE STALNOSTI SVOJSTAVA INOVATIVNOG GRAĐEVNOG PROIZVODA

U okviru projekta „Razvoj inovativnih građevnih kompozita primjenom biopepela“ provedeno je preliminarno istraživanje utjecaja otpadnog PDB-a kao djelomične zamjene cementa ili sitnog agregata u proizvodnji inovativnog građevnog proizvoda – vibroprešanog betonskog rubnjaka prema normi HRN EN 1340⁹. Proizvođač utvrđuje da se građevni proizvod nalazi u usklađenom području budući da norma HRN EN 1340 ima dodatak ZA kojim se određuju bitne značajke proizvoda u odnosu na temeljne zahtjeve za građevinu te propisuje svojstva građevnog proizvoda i metode i kriterije ocjenjivanja svojstava proizvoda u odnosu na navedene bitne značajke. S obzirom na namjeravanu uporabu inovativnog građevnog proizvoda danog u tablici 3, vibroprešani betonski rubnjak s otpadnim PDB-om može se svrstati u sustav 4.

Tablica 3. Ocjenjivanje i provjera stalnosti svojstava

Proizvod	Namjeravana uporaba	Razina/e ili razred/i	Sustav ocjenjivanja i provjere stalnosti svojstava
Predgotovljeni betonski rubnjaci	Vanjska upotreba i završetak ceste za pokrivanje vanjskih pješačkih i prometnih površina	Azbest: nema sadržaja	4
	Unutarnja upotreba, uključujući zatvorene prostore javnog prijevoza	Reakcija na požar: A1	4
		Azbest: nema sadržaja	
	Krov	Smatra se da zadovoljavaju vanjski požarni učinak	4
Azbest: nema sadržaja			

Izvor: Hrvatski zavod za norme, HRN EN 1340:2004/AC:2007: „Betonski rubnjaci – Zahtjevi i ispitne metode (EN 1340:2003/AC:2006), 2007.

⁹ Hrvatski zavod za norme, HRN EN 1340:2004/AC:2007: „Betonski rubnjaci – Zahtjevi i ispitne metode (EN 1340:2003/AC:2006), 2007.

Proizvođač provodi kontrolu tvorničke proizvodnje i određuje tip proizvoda na temelju ispitivanja tipa, izračuna tipa, tabličnih vrijednosti ili opisane dokumentacije proizvoda, dok prijavljeno tijelo u ovom sustavu nema zadataka (tablica 2).

4.1. Kontrola tvorničke proizvodnje

Proizvođač mora uspostaviti, dokumentirati i održavati stalnu i unutar-nju kontrolu proizvodnje u tvornici, u skladu s odgovarajućim usklađenim tehničkim specifikacijama. Kontrola tvorničke proizvodnje sastoji se od niza postupaka, redovitih inspekcija i ispitivanja te korištenja rezultata za kontrolu sirovina i drugih ulaznih materijala, opreme, procesa proizvodnje i proizvoda. Dokumentacija o sustavu kontrole proizvodnje osigurava opće razumijevanje osiguravanja kvalitete i omogućuje postizanje zahtijevanih značajka proizvoda i učinkovitu provjeru funkcioniranja sustava kontrole proizvodnje.

4.2. Ispitivanje tipa proizvoda

Početno ispitivanje tipa provodi se kako bi se pokazala sukladnost s normom HRN EN 1340 na početku proizvodnje novog tipa proizvoda ili grupe proizvoda ili postavljenjem nove proizvodne linije kako bi se potvrdilo da postignuta svojstva građevnog proizvoda zadovoljavaju zahtjevima propisanim normom i vrijednostima koje je deklarirao proizvođač (tablica 4).

4.2.1. Početno ispitivanje tipa

Kada je građevni proizvod prethodno ispitan u skladu s HRN EN 1340 (isti proizvod, istih bitnih značajki, istih ili zahtjevnijih metoda ispitivanja i postupaka uzorkovanja), rezultati se mogu koristiti za izvještaj o početnom ispitivanju tipa.

Tablica 4. Plan uzorkovanja i kriterij sukladnosti za početno i daljnje ispitivanje tipa⁹

Svojstvo	Zahtjevi	Metoda ispitivanja	Broj rubnjaka	<i>kriteriji ocjenjivanja svojstava</i>
Vizualni pregled	5.4	Dodatak J	8 ¹⁾	Niti jedan rubnjak ne smije imati pukotine, ljuštenje ili delaminacije ²⁾
Debljina zaštitnog sloja	5.1	C.6	8	Svaki rubnjak mora zadovoljavati zahtjeve
Oblik i dimenzije	5.2	Dodatak C ²⁾	8 ¹⁾	Svaki rubnjak mora zadovoljavati zahtjeve
Čvrstoća na savijanje	5.3.2 – Tablica 3	Dodatak F	8	Niti jedan rubnjak ne smije imati čvrstoću na savijanje manju od karakteristične vrijednosti određene razredom
Otpornost na habanje (samo razredi 3 i 4)	5.3.3.	Dodatak G ili H	3	Svaki rubnjak mora zadovoljavati zahtjeve
Otpornost na klizanje (samo kada se ispituje)	5.3.4.	Dodatak I	5	Mora se odrediti srednja vrijednost od 5 rubnjaka
Otpornost na vremenske utjecaje - razred 2 - razred 3	5.3.1 5.3.1	Dodatak E Dodatak D	3 3	Niti jedan rubnjak ne smije imati upijanje vode veće od 6 % po masi. Srednja vrijednost od 3 rubnjaka ne smije biti veća od 1,0 kg/m ² te nijedan pojedinačni rezultat ne smije biti veći od 1,5 kg/m ²
1) Ovi rubnjaci mogu se koristiti za naknadna ispitivanja. 2) C.6 odnosi se samo na rubnjake sa površinskim slojem.				

Izvor: Hrvatski zavod za norme, HRN EN 1340:2004/AC:2007: „Betonski rubnjaci – Zahtjevi i ispitne metode (EN 1340:2003/AC:2006), 2007.

Na temelju ocjene rezultata početnog ispitivanja tipa proizvoda može se zaključiti da tehnička svojstva ispitanog proizvoda zadovoljavaju kriterije sukladnosti norme HRN EN 1340 (tablica 4) za početno ispitivanje tipa za određene razrede⁹.

4.2.2. Daljnje ispitivanje tipa

U slučaju promjena u sirovinama, korištenim omjerima, proizvodnoj opremi ili proizvodnom procesu, koji bi mogli značajno promijeniti određena ili sva svojstva građevnog proizvoda, ispitivanja tipa moraju se ponoviti za odabrano svojstvo ili svojstva (tablica 4.). Primjer takve promjene je i djelomična zamjena cementa ili sitnog agregata otpadnim PDB-om⁹.

4.3. Stavljanje građevnog proizvoda na tržište

Za svaki građevni proizvod obuhvaćen usklađenom normom, oznaka CE predstavlja jedinu oznaku kojom se potvrđuje sukladnost građevnog proizvoda s objavljenim svojstvom u vezi s bitnim značajkama obuhvaćenima tom usklađenom normom. Dodatak ZA propisuje svojstva koja su skladu s bitnim značajkama građevnih proizvoda s obzirom na vrstu i namjeravanu uporabu građevnog proizvoda. Za predgotovljene betonske rubnjake namijenjene vanjskoj uporabi i završetcima ceste za odjeljivanje površine različitih visina i karaktera namjene, u izjavi o svojstvima potrebno je objaviti sljedeća svojstva: čvrstoću na savijanje, otpornost na klizanje, upijanje vode, otpornost na smrzavanje/odmrzavanje sa soli nakon 28 ciklusa, otpornost na habanje. Sastavljanjem izjave o svojstvima, proizvođač preuzima odgovornost za sukladnost građevnog proizvoda s takvim objavljenim svojstvima. Prije stavljanja betonskog rubnjaka na tržište, postavlja se oznaka CE kojom se potvrđuje sukladnost građevnog proizvoda s objavljenim svojstvima u vezi s bitnim značajkama obuhvaćenim usklađenom normom.

5. ZAKLJUČAK

Prema načelima kružne ekonomije, upotreba otpadnog PDB-a u građevnim proizvodima kao djelomična zamjena cementa ili agregata pokazuje veliki potencijal, budući da se na takav način smanjuje nastajanje otpada, povećava recikliranje i oporaba otpada. Međutim, prilikom stavljanja inovativnog građevnog proizvoda na tržište Republike Hrvatske i unutar EU, proizvođač *i prijavljeno tijelo odnosno odobreno tijelo ili tijelo za tehničko ocjenjivanje* dužni su provesti ocjenjivanje i provjeru stalnosti svojstava gra-

đevnog proizvoda. Radnje koje se obavljaju u tim postupcima ovise o sustavu ocjenjivanja i provjere stalnosti određenog građevnog proizvoda, a provode se u svrhu izdavanja izjave o svojstvima. Nakon sastavljanja izjave o svojstvima, proizvođač će na građevni proizvod – vibroprešani betonski rubnjak postaviti oznaku CE te staviti na tržište.

ZAHVALA

Istraživanje je provedeno u okviru projekta „Razvoj inovativnih građevnih proizvoda primjenom biopepela“ koje financira Ministarstvo gospodarstva, poduzetništva i obrta temeljem „Ugovora o dodjeli bespovratnih sredstava za projekte koji se financiraju iz europskih strukturnih i investicijskih fondova u financijskom razdoblju 2014. – 2020.“

Abstract:

ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE OF INNOVATIVE CONSTRUCTION PRODUCTS

Achieving climate neutrality and a sustainable low-carbon circular economy can only be managed through synergies between different sectors. The energy sector remains the largest source of greenhouse gas emissions, contributing more than three quarters of total emissions. On the other hand, the promotion of the use of energy from renewable sources has led to an increased use of wood biomass as a renewable energy source, but despite its great potential, the combustion of wood biomass generates significant amounts of wood biomass ash (WBA) waste. As the development of the waste management sector aims to reduce waste generation, increase recycling and waste recovery, taking into account the environmental role of product design, it is necessary to prevent improper disposal of WBA. According to the principles of the circular economy, there is a great potential for developing synergies between the energy and construction sectors. Indeed, numerous studies have shown that WBA's can be effectively used as partial replacement for cement and/or fine aggregates in the cement and concrete industry. The aim of this study is to identify the possibilities of recycling WBA's in the manufacture of construction products where WBA's have been used as partial substitute for cement and/or fine aggregates. The paper presents the assessment and verification of constancy of performance of an innovative construction product with waste ash from wood biomass - vibrated concrete kerb - with the aim of making a Declaration of Performance.

Key words: Wood biomass ash, construction product, vibrated concrete kerb, Factory Production Control, assessment and verification of constancy of performance, Declaration of Performance.

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8. Zakon o građevnim proizvodima, Narodne novine (76/13, 30/14, 130/17, 39/13, 118/20).
9. Tehnički propis o građevnim proizvodima, Narodne novine (33/10, 81/10, 146/10, 81/11, 100/11, 130/12).

UTJECAJ KOMUNIKACIJSKIH VJEŠTINA NA USPJEŠNOST PRODAJE POLJOPRIVREDNIH PROIZVODA POLJOPRIVREDNIH PODUZEĆA

THE INFLUENCE OF COMMUNICATION SKILLS
ON THE SUCCESS OF SALE OF AGRICULTURAL PRODUCTS

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SAŽETAK:

Tema rada je istražiti te analizirati sve segmente komunikacijskih vještina te njihov utjecaj na uspješnost prodaje. Istraživanje će biti usmjereno prema analizi ključnih parametara uspješnosti prodaje te kako na te parametre utječu komunikacijske vještine. Svrha rada je istražiti u kojoj su mjeri komunikacijske vještine važne za prodajne predstavnike neke tvrtke. Naime, prodajni su predstavnici posrednici između kupca i proizvoda. Kupac koji pokazuje slabiju zainteresiranost za neki proizvod i/ili ga uopće nije mislio kupiti, uz prodajnog predstavnika s visokorazvijenim komunikacijskim vještinama, mogao bi promijeniti mišljenje. Cilj predloženog istraživanja je obrazložiti i predložiti smjernice razvijanja komunikacijskih vještina prodajnih predstavnika s ciljem što boljeg poslovanja matične tvrtke te ukazati na potrebu ulaganja u obrazovanje takvih djelatnika te u unaprjeđivanje menadžerskih vještina važnih za učinkovitu prodaju proizvoda, a posebno u dijelu razine komunikacijskih vještina kao faktora kvalitete, koje moraju imati takvi kadrovi.

Ključne riječi: komunikacijske vještine, kvaliteta, menadžerske vještine, uspješnost prodaje.

1. UVOD

Proces komunikacije¹ počinje kod pošiljatelja koji je spreman poslati određenu poruku. Poruka se kodira što znači da pošiljatelj svoje misli organizira pomoću simbola u razumljivu, točnu, jasnu, uvjerljivu i sadržajno osmišljenu poruku željenom primatelju. Putem medija ili komunikacijskog kanala poruka putuje od pošiljatelja do primatelja. Primatelj mora dekodirati poruku, što znači da mora otkriti značenje poruke i sadržaja poruke. Nakon što je dekodirao poruku, primatelj se ponaša na određeni način, a to je reakcija na poruku. Naposljetku, primatelj može odaslati povratnu informaciju pošiljatelju, ali to i ne mora učiniti. Za vrijeme komunikacije mogu se pojaviti (ali i ne moraju) određene smetnje koje otežavaju ili čak i potpuno onemogućuju komunikaciju.

Iz navedene definicije jasno je koliko je komunikacija važan segment u poslovanju neke tvrtke, a posebno u tvrtkama vezanim za poljoprivredu obzirom na stanje poljoprivrede u Republici Hrvatskoj. Stoga, zaposlenici moraju raditi na usavršavanju vlastitih znanja, sposobnosti i vještina kako bi bili što konkurentniji na zahtjevnom tržištu te kako bi mogli zadovoljiti očekivanja nadređenih.

Najveći dio poslovanja poljoprivrednih tvrtki, pored proizvodnje, temelji se na prodaji, a za prodaju su iznimno važne komunikacijske vještine prodavača. Pritom se pod komunikacijskim vještinama misli i na verbalnu i neverbalnu komunikaciju. Prodavač, odnosno prodajni predstavnik koji razvije sposobnost uljudne komunikacije s klijentom i nauči kako zainteresirati klijenta za kupnju nekog proizvoda, trebao bi biti uzor svim drugim zaposlenicima. Rad u uvjetima u kojima se na tržištu ne nalazi ravnoteža ponude i potražnje, a pritom je ponuda višestruko veća nego potražnja, što je slučaj kada se radi o trgovini poljoprivrednih proizvoda, zahtjevan je i traži konstantna usavršavanja i samostalan rad zaposlenika na jačanju vlastitih kompetencija. Ovaj rad je nastao iz potrebe da se dokaže da su visokorazvijene komunikacijske vještine nužna osobina i čimbenik kvalitete prodajnih predstavnika u poljoprivrednim tvrtkama, ali i u svim ostalim tvrtkama koje žele ostvariti konkurentsku prednost na današnjem sve zahtjevnijem tržištu.

¹ Linda Martić Kuran, Petra Jelić, *Poslovno komuniciranje*, Veleučilište „Marko Marulić“ u Kninu, Knin, 2014.

1.1. Predmet, ciljevi i hipoteze istraživanja

Predmet ovoga rada je prikazati važnost komunikacije kao faktora kvalitete, kako verbalne tako i neverbalne, u radu s klijentima u segmentu prodaje poljoprivrednih proizvoda.

Svrha rada je istražiti u kojoj su mjeri komunikacijske vještine važne za prodajne predstavnike. Naime, prodajni su predstavnici posrednici između kupca i proizvoda. Kupac koji pokazuje slabiju zainteresiranost za neki proizvod i/ili ga naprosto uopće nije mislio kupiti, uz prodajnog predstavnika s visokorazvijenim komunikacijskim vještinama, mogao bi promijeniti mišljenje.

Ciljevi rada:

- a) ispitati stavove kupaca/klijenata i potencijalnih kupaca/klijenata o važnosti komunikacijskih vještina prodajnih predstavnika,
- b) pružiti potencijalnim poslodavcima smjernice za osposobljavanje zaposlenika koji će raditi u prodaji s kupcima te istaknuti važnost visokorazvijenih komunikacijskih vještina,
- c) zaposlenicima u poljoprivrednim trgovinama prikazati važnost razvijanja komunikacijskih vještina kao faktora kvalitete,
- d) dokazati navedene hipoteze.

Hipoteze:

H1: Komunikacijske vještine kao faktor kvalitete prodajnog predstavnika temeljni su uvjet su za uspješnu prodaju poljoprivrednih proizvoda.

H2: Ulaganje u razvoj takvih vještina zaposlenika tvrtku čini konkurentnijom te u konačnici uspješnijom.

1.2. Metodologija istraživanja

Metode² koje su korištene u istraživanju su u prvom redu metoda anketnog upitnika koja je provedena na kupcima i posjetiteljima, odnosno klijentima te potencijalnim klijentima (vlasnicima obiteljskih poljoprivrednih gospodarstava - *OPG*) poljoprivrednih poduzeća. U anketi su ispitani stavovi kupaca o važnosti verbalne i neverbalne komunikacije prodavača te utjecaju komunikacije na odluku o kupnji. Anketa je napravljena online, a provedena

² Miroslav Žugaj, Ksenija Dumičić, Vesna Dušak, *Temelji znanstvenoistraživačkog rada*, TUVA, Varaždin, 2006.

je nasumice odabranim uzorkom ispitanika (pedesetak ispitanika). Ispitanici su anketu ispunjavali na tabletu autora rada, samostalno, kako bi se garantirala točnost odabranog uzorka ispitanika.

Nakon provedbe ankete, koristi se statistička obrada dobivenih rezultata istraživanja koji su prikazana grafički te dodatno objašnjeni. Na kraju je korištena i metoda intervju s odabranim zaposlenicima tvrtke. Zaposlenici su isto tako odabrani nasumičnim putem, zaposleni na različitim mjestima unutar tvrtke, različite su dobi i različitog spola, a intervju ima cilj pokušati dobiti stavove zaposlenika o važnosti verbalne i neverbalne komunikacije za uspješnu prodaju.

2. VAŽNOST KOMUNIKACIJE U PRODAJI

Čovjek je svakodnevno izložen brojnim interakcijama, kako svjesnim tako i nesvjesnim, neke se od njih odvijaju putem riječi, a neke se odvijaju neverbalnim putem, bez riječi. Upotreba govora kao segmenta verbalne komunikacije svojstvena je isključivo čovjeku, što znači da druga živa bića ne mogu komunicirati govorom. No, govorna komunikacija samo je mali segment različitih načina čovjekova komuniciranja.

Postoje brojne podjele³ komunikacije. Komunikacija koja se odvija između dvoje ljudi, najčešće licem u lice, ali i drugim načinima, primjerice, telefonski ili putem računala, naziva se interpersonalnom komunikacijom. Interpersonalna se komunikacija dijeli na verbalnu i neverbalnu komunikaciju, što su dva značajna oblika komunikacije, stoga se u nastavku opisuju ova dva oblika komunikacije.

2.1. Verbalna komunikacija

Svakodnevna komunikacija⁴ obično se odvija putem neobaveznog čavrljanja, govorom, a za nju nisu potrebne nikakve posebne vještine niti sposobnosti. Komunikacija koja se odvija putem govora naziva se verbalnom komunikacijom. Ovaj oblik komunikacije uči se od rođenja, a iako ju čovjek obično savlada u prvih nekoliko godina nakon rođenja, može se usavršavati za vrijeme cijelog čovjekovog života. Verbalna se komunikacija može podijeliti na dvije manje skupine. Kada se verbalno prenose poruke, vrlo je važno

³ Marin Buble, *Poslovno vođenje*, M.E.P., Zagreb, 2011.

⁴ Marija Tomašević Lišanin, Selma Kadić-Maglajlić, Nikola Drašković, *Principi prodaje i pregovaranja*, Ekonomski fakultet, Sveučilište u Zagrebu, Zagreb, 2019.

kako se govori. Pažnja se u verbalnoj komunikaciji stoga pridaje glasnoći, brzini, intonaciji te artikulaciji. Brzina govora treba se mijenjati jer se promjenom brzine govora održava pažnja slušatelja, a sam govor dobiva na zanimljivosti. Koliko je govor glasan ovisi o publici, odnosno o udaljenosti publike od osobe koja govori. Osoba koja govori iznimno glasno, mora govoriti tiše kada komunicira telefonski ili kada se obraća tihoj i mirnoj osobi. Zahvaljujući intonaciji, govornik može naglasiti određene dijelove govora koje smatra važnijima. Artikulacija, odnosno sam izgovor riječi treba biti jasan zato što se tako slušatelju olakšava sudjelovanje u komunikacijskom procesu.

U verbalnu komunikaciju⁵ ubrajaju se vokalna i ne-vokalna komunikacija. Kod vokalne komunikacije govornici se koriste izgovorenim jezikom, riječima, a kod ne-vokalne komunikacije koriste se pisani jezik, jezik kojim se koriste gluhonijeme osobe, zviždanje ili bubnjanje te Morseovi znakovi.

2.2. Neverbalna komunikacija

Za razliku od verbalne komunikacije, neverbalna se komunikacija⁶ prilikom prenošenja poruke ne služi riječima, već bilo kojim drugim načinom komuniciranja osim riječima.

Neverbalna komunikacija⁷ može se odvijati putem različitih komunikacijskih kanala, a to su vizualni kanali, izrazi lica, govor tijela, osobni prostor, način odijevanja te parajezik. U vizualne kanale ubrajaju se kontakti očima koji su važni na početku razgovora. Razgovor bi uvijek trebao započeti uspostavljanjem kontakta očima, no i kod uspostavljanja kontakta očima potreban je oprez jer predug kontakt očima može biti shvaćen kao prijeteći. Izrazi lica značajni su zato što kod prvog vizualnog kontakta s nekom osobom, pažnju dobiva lice te osobe, a lice je najizraženiji dio svakoga čovjeka koji će sugovornik upamtiti. Za vrijeme komunikacije, izrazi lica najviše služe za prikazivanje emocija, a iz izraza lica može se zaključiti je li komunikacija zanimljiva. Govor tijela odnosi se na kimanje glavom, geste rukama, držanje tijela, eventualne taktilne podražaje te orijentaciju tijela. Primjerice, geste rukama služe kako bi naglasile ono o čemu se govori, a kimanje glavom sugovorniku može dati povratnu informaciju o slaganju ili neslaganju s onim o čemu govori.

⁵ Renata Fox, *Poslovna komunikacija*, Hrvatska sveučilišna naknada, Pučko otvoreno učilište Zagreb, Zagreb, 2006.

⁶ Judith A. Hall, Mark L. Knapp, *Neverbalna komunikacija u ljudskoj interakciji*, Naknada Slap, Jastrebarsko, 2010.

⁷ Martina Mihalinić, *Upravljanje krizama i komuniciranje*, Veleučilište Velika Gorica, Velika Gorica, 2018.

Naposljetku, potrebno je istaknuti da je verbalnu i neverbalnu komunikaciju nemoguće odvojiti, zato ih je i besmisleno promatrati kao dva u potpunosti odvojena segmenta komunikacijskog procesa. Verbalno i neverbalno komuniciranje nalaze se u međusobnom odnosu za vrijeme ljudske komunikacije, a neverbalna komunikacija pritom može ponoviti ono što je rečeno, može proturječiti rečenom, dopuniti rečeno, zamijeniti rečeno, istaknuti rečeno te regulirati rečeno.

2.3. Poslovna komunikacija

Poslovna komunikacija u poduzeću može se u najširem smislu podijeliti na formalnu poslovnu komunikaciju te na neformalnu poslovnu komunikaciju. Formalna komunikacija je komunikacija koja se unaprijed planira, sustavna je, službena te usklađena s potrebama poduzeća, a dijeli se na⁸:

- a) vertikalnu komunikaciju prema dolje – od osoba na višim organizacijskim razinama prema osobama na nižim organizacijskim razinama,
- b) vertikalnu komunikaciju prema gore – od osoba na nižim organizacijskim razinama prema osobama na višim organizacijskim razinama,
- c) horizontalnu komunikaciju – između osoba na istoj organizacijskoj razini,
- d) lateralnu komunikaciju - između osoba na istoj ili sličnoj organizacijskoj razini te između osoba na različitim organizacijskim razinama (dijagonalno).

Vertikalna komunikacija prema dolje je komunikacija kojom nadređeni komuniciraju s podređenima, a vertikalna komunikacija prema gore je komunikacija kojom podređeni komuniciraju s nadređenima. Horizontalna komunikacija odnosi se na komunikaciju između zaposlenih unutar jedne razine u poduzeću (npr. u odjelu prodaje), a lateralna komunikacija odnosi se na svu komunikaciju među različitim organizacijskim razinama. Formalna poslovna komunikacija način je komunikacije koji se koristi u svakodnevnom poslovanju svakog poduzeća, a potiče ju i vodstvo poduzeća zato što je nužna za obavljanje poslova. Osim formalne komunikacije, u poduzeću se konstantno odvija i neformalna komunikacija. Neformalna komunikacija u poslovanju vrlo je složena te se temelji na osobnim dodirima među zaposlenicima, a također nema ni nikakva strogo određena pravila i načela. U neformalnoj

⁸ Zvonimir Jurković, „Važnost komunikacije u funkcioniranju organizacije“, *Ekonomski vjesnik*, XXV(2), str. 387-399, Zagreb, 2012.

komunikaciji sudjeluju pripadnici različitim grupa u poduzeću koji dolaze s različitih hijerarhijskih razina te se konstantno mijenja i odnos među tim pojedincima.

Poslovna je komunikacija⁹ važna i zato što doprinosi stvaranju identiteta i imidža poduzeća. Identitet poduzeća odnosi se na kombiniranje načina na koji se izražava osobnost poduzeća, a kombiniraju se dizajn, logotip, boje, ponašanje, organizacijska kultura, vrijednosti, poruke, način na koji se komunicira, veze te sponzorstva. Imidž poduzeća je slika koju javnost ima o poduzeću, a nastaje na temelju znanja i iskustava javnosti o nekome poduzeću.

2.4. Važnost komunikacije u prodaji

Prodaja se može smatrati poslovnim procesom, taj poslovni proces sastoji se od tri faze, a u svakoj od tih faza komunikacija ima odlučujuću ulogu:¹⁰

- *inicijativa* - pokreću je prodavač ili kupac, obično prodavač kupcu nudi robu po određenoj cijeni,
- *zaključak* - i prodavač i kupac pristaju na kupoprodajne uvjete te
- *realizacija* - kupac dobiva plaćenu robu, a prodavač dobiva novac ili drugo sredstvo plaćanja.

Postoje tri karakteristike prodavača koje su preduvjet uspješne komunikacije s kupcima:

- 1) *Sličnost s kupcem*: Prodavači koji su slični kupcu bit će uspješniji u prodaji. Osim općenite sličnosti, važne karakteristike uspješnog prodavača su sličnost s kupcem u osobnom iskustvu, u razvijenosti emocionalne inteligencije te sličnost u osobnim obilježjima.
- 2) *Povjerenje*: Povjerenje između prodavača i kupca značajan je preduvjet ostvarenja uspješne komunikacije. Prodavač može pridobiti povjerenje kupca na temelju ugleda, stručnosti, moći, istinoljubivosti, a svaki prodavač mora težiti zadobivanju povjerenja kupaca.
- 3) *Sposobnost slušanja*: Prodavač mora pažljivo slušati kupca kako bi se upoznao s njegovim potrebama i željama jer će samo tako njihova komunikacija dovesti do ostvarenja pozitivnog poslovnog ishoda – prodaje.

⁹ Sandra Mrvica Mađarac, Stjepan Jelica, „Poslovna komunikacija – poseban osvrt na njezinu ulogu u prodaji roba i usluga“, Mostariensia, Vol. 19, No. 1, Mostar, 2015, str. 149-158.

¹⁰ Ibid.

Kod komunikacije s kupcima, dobro je pridržavati se nekoliko općenitih pravila koja će dovesti do uspješne i kvalitetne komunikacije:¹¹

Postavljanje pitanja

Pitanja su vrlo važna zato što omogućuju osobi koja ih postavlja da kontrolira razgovor i usmjerava ga u željenom pravcu. Prodavač koji postavlja pitanja osigurava si vrijeme da osmisli odgovor te tako sprječava mogućnost da se kupac ne složi s njim.

Najava određenog ponašanja

U razgovoru se mogu najaviti određene radnje koje će prodavač napraviti, izraz kao što je „Nešto bih Vas pitao“ pokazuje da će prodavač kupcu postaviti pitanje.

Neisticanje neslaganja

Prodavač ne bi trebao isticati neslaganje s klijentom zato što će ga klijent onda prestati slušati.

Neširenje vlastitih argumenata

Prodavač bi trebao koristiti nekoliko snažnih argumenata, umjesto mnoštvo slabijih. Ako se koristi više slabijih argumenata, kupac bi ih mogao krenuti osporavati, a lakše će osporiti nekoliko slabijih argumenata nego jedan snažan.

Izbjegavanje personaliziranih rasprava

Za vrijeme prodajnog razgovora ne bi trebalo doći do osobnih rasprava između prodavača i kupca.

Brojna provedena istraživanja¹² pokazala su povezanost komunikacije s nekim od segmenata poduzeća koji čine uspješno poslovanje. U navedenom istraživanju je dokazano da intenzitet korporacijskih komunikacija ima pozitivan utjecaj na stvaranje imidža poduzeća te da poduzeća koja imaju tako povećani imidž bolje konkuriraju na tržištu. Zato bez uspješne poslovne komunikacije nema ni uspješnog poslovanja koje se temelji na sposobnosti ostvarenja ciljeva i planova poduzeća te ostvarivanja dobiti.

¹¹ Marija Tomašević Lišanin, Selma Kadić-Maglajlić, Nikola Drašković, *Principi prodaje i pregovaranja*, Ekonomski fakultet, Sveučilište u Zagrebu, Zagreb, 2019.

¹² Valentina Pirić, „Utjecaj korporacijskih komunikacija na imidž i konkurentnost poduzeća“, *Market-Tržište*, Vol. 20, No. 2, Zagreb, 2008, str. 149-162.

3. REZULTATI ISTRAŽIVANJA

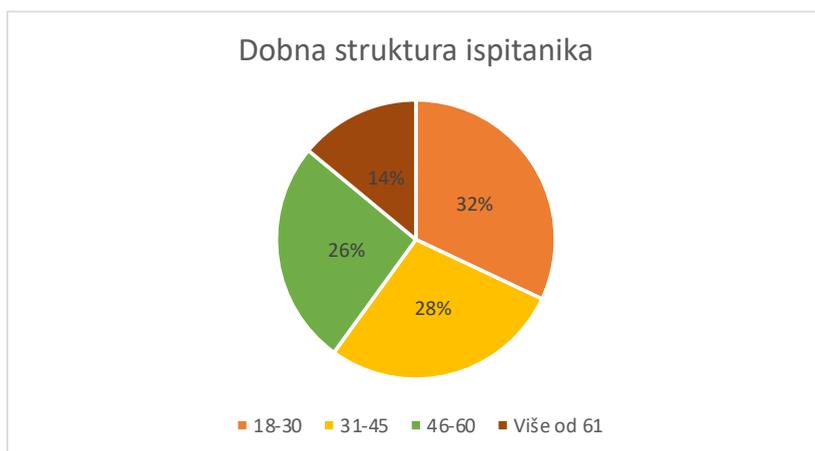
Za potrebe rada i testiranje postavljenih hipoteza, provedena je anketa s kupcima i posjetiteljima, odnosno klijentima te potencijalnim klijentima, vlasnicima obiteljskih poljoprivrednih gospodarstava i drugim posjetiteljima. U anketi su se ispitali stavovi kupaca o važnosti verbalne i neverbalne komunikacije prodavača odnosno prodajnih predstavnika te o utjecaju komunikacije odnosno komunikacijskih vještina na odluku o kupnji. Anketa je provedena online na uzorku od 50 ispitanika, a provedena je nasumice odabranim uzorkom ispitanika.

Ispitanici su anketu ispunjavali samostalno. Ispitanici nisu bili obvezni odgovoriti na sva pitanja. Nakon provedbe ankete, dobiveni rezultati istraživanja statistički su obrađeni, a u nastavku rada rezultati su prikazani grafički te dodatno tekstualno pojašnjeni.

3.1. Socio-demografski podaci

Cilj prvog dijela istraživanja bio je saznati tko su klijenti i potencijalni klijenti poduzeća poljoprivrednih proizvoda. Ovaj dio istraživanja sastojao se od pet pitanja. Istraživanju su pristupili ispitanici različitih dobnih skupina. Mogli su sudjelovati isključivo punoljetni ispitanici, dakle ispitanici stariji od 18 godina. Dobna struktura ispitanika prikazuje se grafikonom 1.

Grafikon 1. Dobna struktura ispitanika



Izvor: Vlastito istraživanje.

Klijenti i potencijalni klijenti uključeni u istraživanje mogu se podijeliti u četiri dobne skupine. U najmlađoj dobnoj skupini nalaze se ispitanici koji imaju od 18 do 30 godina, a ukupno je iz te dobne skupine sudjelovalo 16 ispitanika što je 32% u ukupnom broju ispitanika. Slijedi dobna skupina od 31 do 45 godina u kojoj je 28% ispitanika. U dobnoj skupini od 46 do 60 godina nalazi se 26% ispitanika, a najmanje ispitanika starije je od 61 godine pa tako u toj dobnoj skupini ima 14% ispitanika. U istraživanju su mogle sudjelovati osobe oba spola, a zastupljenost ispitanika prema spolu je približno ista.

Jedno od kriterija strukturiranosti dobivenih rezultata je i stupanj obrazovanja. Ispitanici su postigli različite stupnjeve obrazovanja, što je prikazano u grafikonu 2.

Grafikon 2. Najviši postignuti stupanj obrazovanja



Izvor: Vlastito istraživanje.

Osobe uključene u istraživanje mogle su biti vlasnici *OPG*-a, ali su mogli sudjelovati i ispitanici koji nisu vlasnici *OPG*-a. Postotak *OPG*-a u vlasništvu ispitanika prikazan je grafikonom 3.

Grafikon 3. Postotak OPG-a u vlasništvu ispitanika



Izvor: Vlastito istraživanje.

Većina ispitanika nije vlasnik obiteljskog poljoprivrednog gospodarstva (68% ispitanika), a 32% ispitanika ima *OPG* u vlasništvu. Grafikon 4 prikazuje postotak ispitanika koji su zaposleni na *OPG*-u.

Grafikon 4. Postotak ispitanika zaposlenih na OPG-u



Izvor: Vlastito istraživanje.

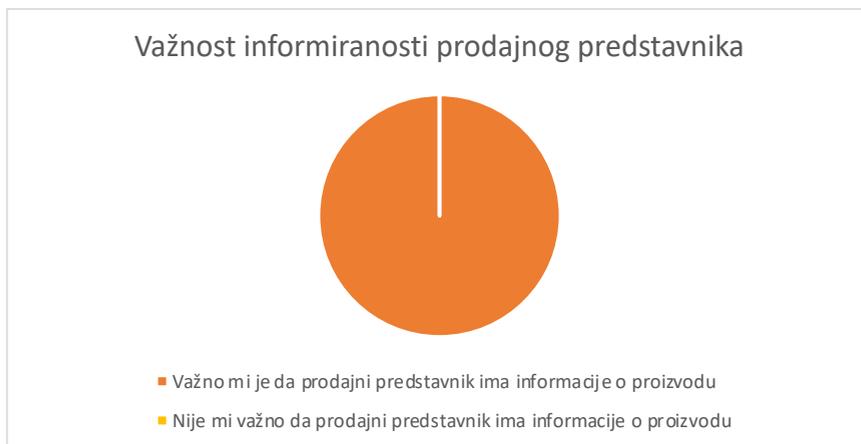
Ispitanici su u velikoj mjeri zaposleni na *OPG*-u (62% ispitanika), a 38% ispitanika nije zaposleno na *OPG*-u.

3.2. Rezultati istraživanja stavova klijenata i potencijalnih kupaca

Cilj drugog dijela istraživanja bio je ispitati stavove klijenata i potencijalnih klijenata poljoprivrednih poduzeća o važnosti komunikacijskih vještina prodajnih predstavnika.

Prodajni predstavnici trebali bi posjedovati širok spektar znanja o proizvodima koje prodaju, stoga je prvo pitanje ispitivalo je li informiranost prodajnog predstavnika važna, a rezultat je prikazan grafikonom 5.

Grafikon 5. Važnost informiranosti prodajnog predstavnika



Izvor: Vlastito istraživanje.

Informiranost prodajnog predstavnika važna je svim ispitanicima koji su sudjelovali u istraživanju, stoga nijedan ispitanik nije odgovorio da mu informiranost nije važna. Svi ispitanici (100%) istaknuli su da im je važno da prodajni predstavnici raspolažu informacijama o proizvodu kojega prodaju. Osim informiranosti, ispitanicima je važno i raspoloženje prodajnog predstavnika, što je prikazano grafikonom 6.

Grafikon 6. Važnost raspoloženja prodajnog predstavnika



Izvor: Vlastito istraživanje.

Osim informiranosti, vrlo je važno i raspoloženje prodajnog predstavnika pa je tako 94% ispitanika istaknulo da im je ono važno, a 6% ispitanika smatra da raspoloženje prodajnog predstavnika nije važno. Cilj svakog prodajnog predstavnika trebao bi biti uspostaviti odnos pun povjerenja sa svojim klijentima, a grafikon 7. prikazuje u kojemu postotku ispitanici vjeruju prodajnim predstavnicima.

Grafikon 7. Postotak ispitanika koji imaju povjerenja u prodajne predstavnike



Izvor: Vlastito istraživanje.

Iako je odnos pun povjerenja s klijentima važan, nisu ga uspjeli uspostaviti svi prodajni predstavnici koji su došli u poslovni odnos s klijentima i potencijalnim klijentima. Naime, 76% ispitanika vjeruje prodajnom predstavniku, a 24% ispitanika mu ne vjeruje. Prodajni predstavnici trebali bi svojim klijentima pružati informacije o proizvodima te bi trebali svojim komunikacijskim vještinama kod klijenta potaknuti postavljanje pitanja i komunikaciju o svemu onome što klijenta zanima. Postotak klijenata koji svoje prodajne predstavnike traže informacije o proizvodima prikazan je grafikonom 8.

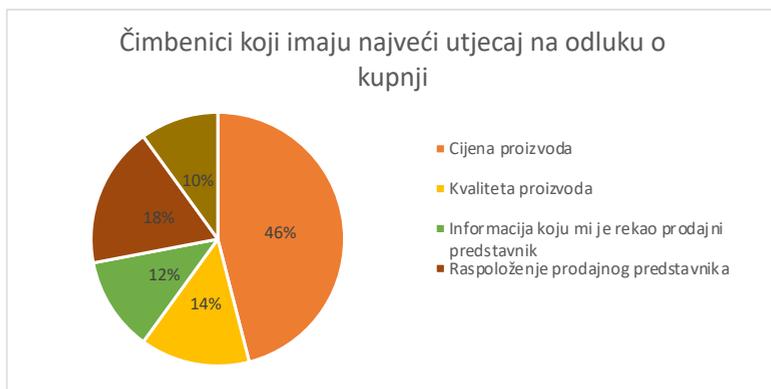
Grafikon 8. Postotak ispitanika koji za informacije o proizvodima pitaju prodajnog predstavnika



Izvor: Vlastito istraživanje.

Iako četvrtina ispitanika ne vjeruje svojim prodajnim predstavnicima, ipak će čak 82% ispitanika u situaciji u kojoj želi saznati neku informaciju o proizvodu, posegnuti za savjetom prodajnog predstavnika. Na kupnju proizvoda (i usluga) osobe se odlučuju zbog niza različitih razloga. Sljedeće pitanje bilo je namijenjeno istraživanju onoga što ima najveći utjecaj na kupnju kod ispitanika. Rezultati su grafički prikazani grafikonom 9.

Grafikon 9. Čimbenici koji imaju najveći utjecaj na odluku o kupnji

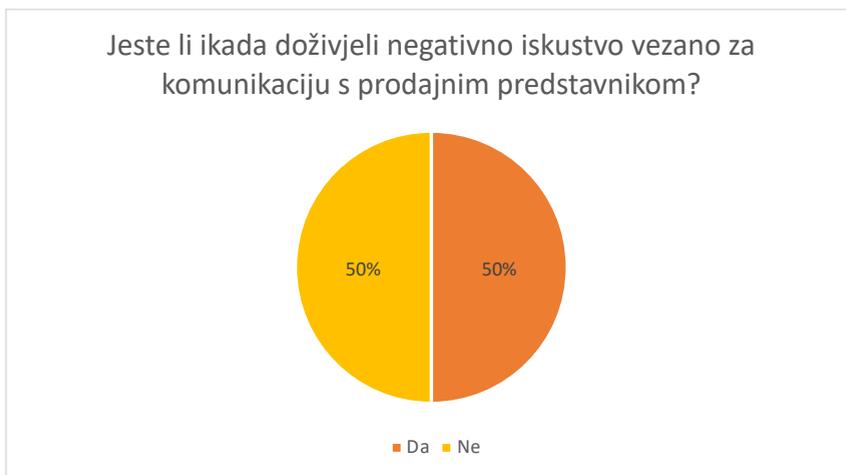


Izvor: vlastito istraživanje

Najveći utjecaj na odluku o kupnji ima cijena proizvoda, kod 46% ispitanika, a kod 14% ispitanika presudna je kvaliteta proizvoda. No, ostalih 40% ispitanika zajedno je odlučujućim čimbenikom za odluku o kupnji procijenilo neki segment koji se veže za prodajnog predstavnika. Tako 12% ispitanika presudnim smatra informaciju koju im je dao prodajni predstavnik, 18% ispitanika najvažnijim smatra raspoloženje prodajnog predstavnika, a 10% ispitanika smatra da je stav prodajnog predstavnika odlučujući čimbenik kod donošenja odluke o kupnji.

Iako se prodajni predstavnici trude ostvariti dobru komunikaciju s klijentima jer o uspješnosti komunikacije ovisi uspješnost prodaje, dio prodajnih predstavnika ima teškoća u ostvarivanju prikladne komunikacije. Grafikon 10 prikazuje postotak ispitanika koji su doživjeli negativno iskustvo u komunikaciji s prodajnim predstavnikom.

Grafikon 10. Postotak ispitanika koji su doživjeli negativno iskustvo u komunikaciji s prodajnim predstavnikom

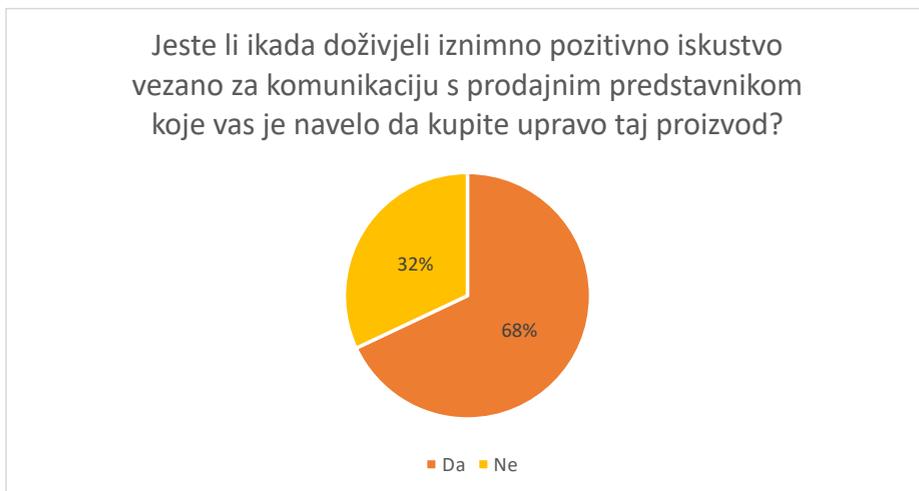


Izvor: Vlastito istraživanje.

Polovina ispitanika doživjelo je negativno iskustvo u komunikaciji s prodajnim predstavnikom. Ispitanici koji su doživjeli negativno iskustvo vezano za komunikaciju s prodajnim predstavnikom u idućem su pitanju mogli navesti o kakvome se iskustvu radi. Svi navedeni problemi koje su ispitanici istaknuli pokazuju da je najveći problem koji su imali u komunikaciji s prodajnim predstavnicima vezan za neki oblik neiskrenosti, neovisno radi li se o neiskrenosti u pogledu rokova dostave, cijena ili nekim drugim slučajnim i/ili namjernim neistinitim i nekvalitetnim informacijama koje su prodajni predstavnici dali klijentima.

Osim negativnih komunikacijskih situacija s prodajnim predstavnicima, ispitanici su imali i iznimno pozitivne komunikacijske situacije koje su ih navele da se odluče na kupnju proizvoda o kojemu su komunicirali s prodajnim predstavnikom. Postotak iznimno pozitivnih iskustava u komunikaciji s prodajnim predstavnicima grafički je prikazan grafikonom 11.

Grafikon 11. Postotak ispitanika koji su doživjeli iznimno pozitivno iskustvo vezano za komunikaciju s prodajnim predstavnikom koje ih je navelo da kupe proizvod



Izvor: Vlastito istraživanje.

Iako je polovica ispitanika iskusila negativno komunikacijsko iskustvo s prodajnim predstavnikom, 68% ispitanika doživjelo je iznimno pozitivno iskustvo vezano za komunikaciju s prodajnim predstavnikom, a to je komunikacijsko iskustvo bilo toliko pozitivno da su se odlučili za kupovinu proizvoda.

4. ZAKLJUČAK

Iz rezultata istraživanja može se izvesti mnogo važnih zaključaka i smjernica. Može se istaknuti kako je jedna od najvažnijih karakteristika modernog tržišta izloženost konkurenciji. Konkurencija je danas velika i nije dovoljno da proizvod ima izvrsne tehničke značajke (kvalitetu), funkcionalnost, dobru cijenu ili neku drugu sličnu karakteristiku, ako ga poduzeće želi uspješno prodati i ostvariti zacrtane ciljeve. Svako poduzeće treba uspostaviti poseban odnos s potencijalnim potrošačem u kojemu komunikacija ima presudnu ulogu; potrošaču se mora svidjeti, mora pozitivno utjecati na njegove emocije, mora ga zainteresirati i izazvati kod njega poseban osjećaj koji će ga potaknuti na kupnju. Stoga je uspješna komunikacija s klijentima i potencijal-

nim klijentima jedan od faktora kvalitete te preduvjeta uspješnog poslovanja poduzeća. Kada se komunikacija sagleda općenito, uspješna komunikacija dovest će do brojnih koristi za poslovanje, a neuspješna komunikacija nanijet će štetu kvaliteti poslovanja.

Prva hipoteza pretpostavila je da su komunikacijske vještine prodajnog predstavnika temeljni uvjet za uspješnu prodaju poljoprivrednih proizvoda. Kao što je navodima iz literature prikazano, suvremena prodaja predstavlja komunikacijsku situaciju u kojoj prodavač i kupac moraju ostvariti pozitivan odnos. Provedeno istraživanje pokazalo je da su dobra informiranost i dobro raspoloženje prodajnih predstavnika iznimno važni te da imaju veliki utjecaj na kupnju. Značajno je istaknuti da ispitanici odluku o kupnji donose na temelju nekog čimbenika koji je vezan za uspješnost komunikacije prodajnog predstavnika.

Druga hipoteza pretpostavila je da ulaganje u razvoj komunikacijskih vještina zaposlenika tvrtku čini uspješnijom. Iz proučene literature vidljivo je da su komunikacijske vještine zaposlenika iznimno važne u zaključivanju prodaje, a kao što je već navedeno, gotovo pola kupaca odlučuje se na kupnju zbog uspješne komunikacije sa zaposlenicima. U istraživanju su ispitanici istaknuli kao najvažnije poželjne osobine znanje/informiranost/stručnost. Na temelju toga može se zaključiti da je ulaganje u razvoj vještina od presudne važnosti za poduzeće. Naposljetku, može se zaključiti da je, pored kvalitete, uspješna komunikacija s klijentima ključ uspjeha u prodaji bilo kojeg segmenta proizvoda ili usluga i može se primijeniti na sve grane gospodarstva.

Abstract:

THE INFLUENCE OF COMMUNICATION SKILLS
ON THE SUCCESS OF SALE OF AGRICULTURAL PRODUCTS

The topic of the paper is to research and analyze all segments of communication skills and their impact on sales performance. The research will be focused on the analysis of key performance indicator of sales and how these performance indicator are affected by communication skills. The purpose of this paper is to research the extend to which communication skills are important for a sales representatives of the company. Namely, sales representatives are intermediaries between the customer and the product. A customer who shows less interest in a product and/or did not intend to buy it at all, along with a sales representative who has highly developed communication skills, could change his mind. The aim of the proposed research is to explain and propose guidelines for developing the communication skills of sales representatives with the aim of better business of company and also indicate on the need

to invest in education of such employees and improve management skills important for the effective sale of products, especially in the part of the communication skills as a part of quality that such employees must have.

Key words: communication skills, managerial skills, quality, sales performance.

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March 16th – 18th, 2022

IDENTIFIKACIJA OPASNOSTI PRI PROIZVODNJI, RADU I ODRŽAVANJU VJETROELEKTRANA

DANGER IDENTIFICATION IN THE PRODUCTION, OPERATION
AND MAINTENANCE OF WIND POWER TURBINES

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SAŽETAK

U radu su navedene opasnosti za zaštitu zdravlja i sigurnost na radu koje mogu nastati pri proizvodnji, radu i održavanju vjetroelektrana. Naime, tehnologije vezane za područje vjetroelektrana razvijaju se nevjerojatnom brzinom, turbine su sve većih dimenzija i sve veće pojedinačne snage. Međutim, iako vjetroelektrane spadaju u „zelene“ proizvođače energije, one predstavljaju značajne rizike za radnike. Često radnici nisu dovoljno osposobljeni za rad na siguran način, izloženi su mnogim novim rizicima a nisu dovoljno svjesni svih opasnosti koje mogu rezultirati ozbiljnim ozljedama, smrti te profesionalnim bolestima. Rade na visini, u skućenim prostorima uz mehaničke opasnosti te opasnosti od električne struje. Najčešće rade na izdvojenim područjima, često su okruženi morem te izloženi lošim vremenskim prilikama i snažnim vjetrovima. Zbog toga je već pri dizajniranju turbina, a kasnije kod proizvodnje, rada i održavanja potrebno identificirati opasnosti i procijeniti rizike. U tu svrhu izrađuju se liste za provjeru koje pomažu pri osiguranju optimalnih uvjeta rada.

Ključne riječi: vjetroelektrane, identifikacija opasnosti, procjena rizika, zaštita zdravlja i sigurnost na radu.

1. UVOD

Energija vjetra glavni je obnovljivi izvor energije i, ako se poduzmu pravi koraci, taj će izvor biti bitan za postizanje europskog cilja obnovljivih izvora energije za sljedeće razdoblje, za borbu protiv klimatskih promjena, jačanje energetske sigurnosti i otvaranje novih radnih mjesta. Obzirom na novu energetska krizu koja potresa čitav svijet, u EU pa tako i u Hrvatskoj naglasak je na proizvodnju energije iz obnovljivih izvora. Naime, Hrvatska očekuje snažan porast korištenja energije iz obnovljivih izvora te predviđa da će do 2050. udvostručiti proizvodnju te zadovoljiti svoje potrebe za električnom energijom.¹

Snaga novih europskih vjetroelektrana u 2019. iznosila je 15,4 GW. Od toga, tri četvrtine otpada na kopnene, a četvrtina na priobalne vjetroelektrane.²

Prilikom rada vjetroelektrana ne postoji emisija ispušnih plinova čime se smanjuje emisija CO₂ i SO₂. Pozitivna strana je i u tome što se vjetroelektrane mogu smjestiti na neobrađivim površinama, poljoprivrednom zemljištu ili morskoj pučini, a ispod stupova vjetroelektrane mogu se obavljati poljoprivredni, stočarski i slični radovi.

Međutim, radnici u sektoru energije vjetra izloženi su opasnostima koje mogu rezultirati smrtnim slučajevima i ozbiljnim ozljedama tijekom različitih faza projekta vjetroelektrane. Izloženi su štetnim tvarima, radu na visini, radu u skučenim prostorima i sl. Za vjetroelektrane na moru ekstremni vremenski uvjeti dovode do dodatnih i specifičnijih opasnosti. Energija vjetra relativno je nova industrija, a neki od radnika često nisu u potpunosti svjesni opasnosti koje postoje u radnom okruženju. Osim toga, brzina kojom se koristi industrija vjetra u EU dovela je do nedostatka vještina kod radnika. Neiskusni radnici uključeni su u procese za koje nisu obučeni, pa su stoga njihova sigurnost i zdravlje ugroženi.³

¹ Josip Bohutinski, „Hrvatska energetska (ne)ovisnost“, Nedjelja, Večernji list, 24.10.2021.

² <http://www.energetika-net.com/vijesti/obnovljivi-izvori-energije/snaga-novih-vjetroelektrana-u-europiuevecana-za-15-4-gw-lani-29951>
<http://www.energetika-net.com/vijesti/obnovljivi-izvori-energije/sve-vise-odobalnih-vjetroelektrana-u-europi-26294>

³ Gorana Lipnjak, „Rizici za zaštitu zdravlja i sigurnosti pri primjeni novih tehnologija“, V. međunarodni stručno-znanstveni skup *Zaštita na radu i zaštita zdravlja*, Zadar, 2014.

2. O VJETROELEKTRANAMA

U ovom poglavlju razmatraju se vjetroelektrane, njihove vrste, kao i prednosti i nedostaci korištenja vjetroelektrana u proizvodnji električne energije.

2.1. Vrste vjetroelektrana

Vjetroelektrane se mogu podijeliti na kopnene, priobalne, plutajuće, vinski i mikro vjetroelektrane.⁴

2.1.1. Kopnene vjetroelektrane

Kopnene vjetroelektrane se grade na čvrstom tlu i najčešći su oblik vjetroelektrana. Instaliraju se najčešće na vrhovima brda ili padina, gdje se najbolje iskorištava ubrzanje koje vjetar dobije prelazeći preko uzvisine. – slika 1.

Slika 1. Vjetroelektrane Royd Moor u Ujedinjenom Kraljevstvu



⁴ Wiki <https://hr.wikipedia.org/wiki/Vjetroelektrana>

2.1.2. Priobalne vjetroelektrane

Priobalne vjetroelektrane grade se na čvrstim temeljima na moru, uglavnom u priobalnom području, gdje je dubina mora obično manja od 60 metara.⁵ Morske instalacije vjetroelektrana su načelno skuplje od kopnenih. Tornjevi su viši, dio je smješten ispod mora a i izgradnja je skuplja. Proizvedena električna energija do kopna se prenosi putem podmorskog kabla. Održavanje je također skuplje, a mora se paziti i na zaštitu od korozije, zbog čega se često dodaju dodatni premazi i katodna zaštita.

2.1.3. Plutajuće vjetroelektrane

Plutajuće vjetroelektrane se postavljaju na plutajuće strukture u dubljem moru. Zahtijevaju veće početne troškove, ali su nove studije pokazale je da zbog mogućnosti korištenja jačih vjetrova na moru imaju isplativost primjene. Obično se više plutajućih vjetroelektrana povezuju kako bi se koristio zajednički podvodni kabel za prijenos električne struje. – slika 2.⁶

Slika 2. Prva veća plutajuća vjetroelektrana *Hywind* u Sjevernom moru



Izvor: Mladen Gvozdrenović, *3D model i animacija vjetroelektrane*, Završni rad, Sveučilište J. J. Strossmayera, Osijek, 2016, str. 8.

⁵ Mladen Gvozdrenović, *3D model i animacija vjetroelektrane*, Završni rad, Sveučilište J. J. Strossmayera, Osijek, 2016, str. 8.

⁶ Ibid, str. 9.

2.1.4. Visinske vjetroelektrane

Koncept visinskih vjetroelektrana se zasniva na iskorištenju energije vjetra u višim slojevima atmosfere. One predstavljaju dizajnirani koncept vjetroelektrana koje su na različite načine podignute u visinu bez potpore tornja. Tijekom posljednjih 20 godina napravljeno je nekoliko desetaka projekata od kojih nekolicina ima šanse za realizaciju. Zajedničko im je to što su predviđene za iskorištavanje vjetra na većim visinama, mogućnost montaže na bilo kojoj lokaciji na svijetu te su u potpunosti ekološki prihvatljive, jer ne ispuštaju stakleničke plinove.⁷

2.1.5. Mikro elektrane

Zanimljiv trend korištenja energije vjetra su manja postrojenja. Od mikro vjetroelektrana od tek 100 watta do srednje velikih od 100.000 watta. Ovisno o veličini, postavljaju se na brodove, ulične svjetiljke, kuće, škole ili industrijske pogone.

2.2. Prednosti vjetroelektrana

Prednosti vjetroelektrana u odnosu na druga energetska postrojenja istog kapaciteta su:

- Energija budućnosti – koristi obnovljiv izvor energije;⁸
- Smanjenje emisije štetnih tvari;
- Potrebna znatno manja površina u odnosu na druga energetska postrojenja istog kapaciteta;
- Utjecaj na okoliš – nema otpada, nema radioaktivnosti;
- Domaća proizvodnja – smanjenje uvoza energije, otvaranje novih radnih mjesta.

2.3. Nedostaci vjetroelektrana

Nedostaci vjetroelektrana u odnosu na druga energetska postrojenja istog kapaciteta su:⁹

⁷ Ibid, str. 10.

⁸ http://novaenergija.hr/energija-vjetra/hrvatska/prednosti_i_koristi_od_iskoristavanja_energije_vjetra/

⁹ <https://sh.wikipedia.org/wiki/Vjetroelektrana>

- Povremenost pogona, ovisno o meteorološkim karakteristikama područja;¹⁰
- Skupa tehnička rješenja za sprječavanje oštećenja vjetroelektrane pri olujnoj snazi i osiguravanje maksimalne snage pri slabom vjetru;
- Potrebna ugradnja multiplikatora s automatskom regulacijom brzina generatora, što također poskupljuje tehničku izvedbu;
- Troškovi održavanja značajna su stavka u cijeni dobivene energije vjetra;
- Prisutno je izvjesno “estetsko zagađenje” u slučaju velikih vjetroelektrana;
- Nezadovoljstvo okolnog stanovništva zbog buke;
- Nepoželjan utjecaj na životinjski svijet u krugu vjetroelektrane – npr. utjecaj na šišmiše.¹¹

3. OPASNOSTI PRI PROIZVODNJI I KONSTRUKCIJI

Izgradnja vjetroelektrane smatra se najkompliciranijom i najopasnijom fazom u životnom ciklusu vjetroelektrane. Opasnosti s kojima se radnici susreću tijekom faze izgradnje vjetroelektrana uključuju:¹²

- pad konstrukcije, tereta ili predmeta tijekom podizanja,
- pad radnika s visine,
- mehaničke opasnosti, poput kontakta s pokretnim dijelovima,
- opasnosti od električnog udara – kratki spojevi, prekomjerno punjenje, elektrostatičke pojave,
- požar ili eksplozija zbog upotrebe zapaljivih materijala,
- ručno rukovanje teškim komponentama turbine,
- ergonomske opasnosti - umor od penjanja po ljestvama ili rada u zatvorenim prostorima ili fiziološki učinci nastali zbog teških podizanja i ponavljajućih pokreta,
- rad s opasnim tvarima,
- rad u skućenim prostorima,
- utjecaj okoliša - vjetar, valovi i struje ili munje,

¹⁰ Ibid.

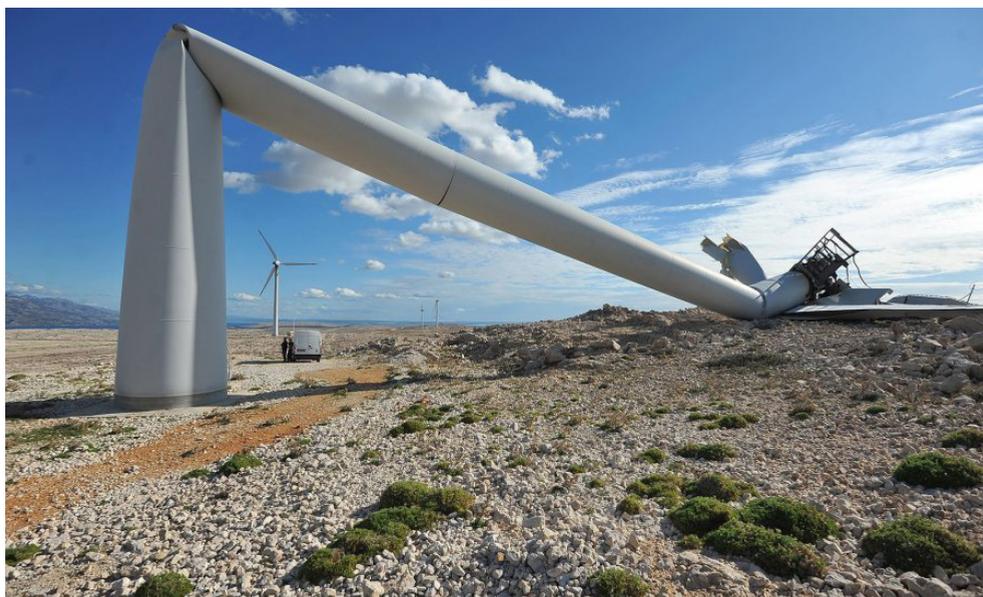
¹¹ <http://www.energetika-net.com/u-fokusu/res-publica/slucaj-sismisi-protiv-vjetroelektrana-17129>

¹² <https://osha.europa.eu/en/publications/occupational-safety-and-health-wind-energy-sector/view>

- organizacijske opasnosti - vremenski pritisak, nedovoljan ili nedostatak sigurnosne opreme,
- nedostatak kompetencije ili vještina radnika.

Razvoj kopnenih i obalnih vjetroelektrana zahtijeva opsežno planiranje i temeljito poznavanje uvjeta na mjestu rada: lokaciju, topografiju, prizemne uvjete i druge čimbenike. U slučaju nepridržavanja svih odredbi postavljenih pravila može doći do teških oštećenja dijelova vjetroelektrana čak i pada kao primjerice pri padu vjetroelektrane na Pagu zbog olujne bure.¹³ – slika 3.

Slika 3. Srušena vjetroelektrana na otoku Pagu



Izvor: Cropix / Autor: Luka Gerlanc / CROPIX

Izgradnja vjetroelektrana zahtijeva velike dizalice, a podizanje komponenti težih od 80 t do visine preko 90 m zahtijeva strogu sigurnosnu provjeru. Dizalice postavljene u blizini instalacija na kopnu predstavljaju rizike poput preopterećenja ili nenamjernog pomicanja grane prema drugim radnicima.

Kod priobalnih vjetroelektrana dizalice utovaruju dijelove na transportna plovila koja se potom dostavljaju na definirano mjesto. Operacije podizanja na

¹³ <https://www.tportal.hr/vijesti/clanak/pogledajte-kako-je-olujna-bura-slomila-vjetrenjacu-od-600-tisuca-eura-foto-20171008>

kopnu moraju uzeti u obzir ekstremne vremenske uvjete koji mogu dovesti do većih opterećenja zbog vjetra ili kretanje plovila tijekom dizanja.

Kod izgradnje tornja radnici su izloženi padovima. Mogu biti ovješeni satima u zraku ili se penju ljestvama i podižu teške materijale. U unutrašnjosti kule, penjanje nepokretnim ljestvama unutar vjetroelektrane može utjecati na radnike. Ljestve zahtijevaju ili sigurnosni kavez ili sigurnosni uređaj. Ugradnja kabela izvodi se ronilačkom operacijom ili primjenom daljinski upravljanih vozila. Ronjenje je opasan i fizički zahtjevan zahvat tijekom različitih faza kao što su postavljanje temelja, polaganje kabela, zavarivanje i redoviti pregledi temelja i različiti popravci. Ronioci se suočavaju s brojnim opasnostima vezanim za samo ronjenje i rad u podvodnom okruženju s alatima ili strojevima, uključujući promjena tlaka tijekom spuštanja na morsko dno ili uspona na površinu, noseći glomaznu i složenu opremu često u dugim vremenskim razdobljima. Ronioci se moraju boriti sa specifičnim uvjetima poput plime i drugih opasnosti na morskom dnu, a rade u uvjetima slabog osvjetljenja ili umjetnog svjetla. Osim toga, profesionalni ronioci često rade s teškim alatima ili strojevima. Za rad su potrebniiskusni i dobro obučeni ronioci. Sve ronilačke operacije trebaju biti dobro planirane i pažljivo upravljane što zahtjeva dodatnu obuku i detaljna uputstva.¹⁴

Radnici su izloženi nizu opasnosti povezanih s opasnim kemikalijama. Kemikalije koje se najčešće spominju su epoksidne smole i plastika ojačana staklom (GRP – glass-reinforced plastic). Sintetičke epoksidne smole koriste se u bojama, ljepilu ili kompozitnim materijalima. Koriste se u proizvodnji, tako da postoji rizik od zaraze uz pojavu alergije i dermatitisa. Lopatice vjetroelektrana proizvedene su iz GRP-a pa je izloženost radnika otapalom (stiren), koji se oslobađa tijekom postupka, teško kontrolirati, posebno obzirom da lopatice vjetroturbina mogu biti dugačke i do 90 metara.¹⁵

Broj radnika koji su uključeni u izgradnju ovisi o veličini vjetroelektrane i zahtjeva velik broj radnika. Tijekom razdoblja izgradnje, na gradilištu su uključeni u proces rada građevinski radnici, inženjeri, geodeti, elektroinstalateri, administrativni zaposlenici i rukovoditelji. Kao i kod svih ostalih građevinskih radova, upravljanje zaštitom zdravlja i sigurnosti na radu izuzetno je važno.

¹⁴ https://cdn.ymaws.com/www.renewableuk.com/resource/collection/AE19ECA8-5B2B-4AB5-96C7-ECF3F0462F75/Offshore_Marine_HealthSafety_Guidelines.pdf

¹⁵ Ann Pontén, Carstensen, Ole Rasmussen, Kurt Brigitta Gruvberger, Marlène Isaksson, Magnus Bruze, „Epoxy-based production of wind turbine rotor blades: occupational dermatoses“, *Contact Dermatitis*, Vol. 5 0, 2004, pp. 329-338.

U projektima priobalnih vjetroelektrana, u cilju prevladavanja nedostatka iskustva ili znanja među ugovornim suradnicima, stvoreni su brojni centri za obuku na kopnu. Obuka uključuje dvodnevni osnovni trening o sigurnosti na moru koji obuhvaća prvu pomoć, zaštitu od požara, hitno spašavanje na moru, osobnu sigurnost.

4. OPASNOSTI PRI RADU

Vjetroelektrane su u osnovi bespilotni objekti s osobljem koje im pristupa samo radi održavanja i popravaka.¹⁶

Vrijeme je ključni operativni faktor koji može predstavljati rizike za radnike na obali i na moru. Planovi rada trebaju uzeti u obzir informacije nacionalnih meteoroloških zavoda. Savjeti koji nacionalni meteorološki uredi daju operatorima vjetroelektrana ne treba podcijeniti.

Iako priobalne vjetroelektrane dijele neke rizike koji se nalaze i u kopnenim instalacijama, podmorsko okruženje je zahtjevnije obzirom na sigurnost. Vjetrovi na moru predstavljaju rizik za radnike tijekom operativne faze. Najopasniji element rada je prebacivanje osoblja u vjetroelektrane zbog inspekcije i održavanja. Kako se vjetroelektranama može pristupiti samo brodom ili helikopterom, mogućnost dolaska je ovisna o stanju mora.

Vjetroelektrane također mogu stvarati niskofrekventnu buku koja je obično 50-70 decibela. Zdravstveni efekti dugotrajne izloženosti niskim razinama niskofrekventne buke nisu poznati, ali postoje tvrdnje da buka uzrokuje simptome poput glavobolje, vrtoglavice, nestabilnosti, mučnine, iscrpljenosti, anksioznosti, razdražljivosti, depresije, kroničnih problema sa spavanjem, gnjeva, zujanja u ušima i problema koncentracije i učenja. Ovi se simptomi ponekad skupno nazivaju sindromom vjetroelektrana.

5. OPASNOSTI PRI ODRŽAVANJU

Operacije održavanja vjetroelektrana mogu biti zahtjevne i predstavljaju brojne opasnosti. Održavanje uključuje uobičajene zadatke poput čišćenja noževa, dijelova za podmazivanje, kompletnog remonta generatora, zamjene komponenata i popravljanja električnih upravljačkih jedinica. Tehničari za održavanje susreću se s rizicima i postupcima za rad na visini, za rad s elek-

¹⁶ https://cdn.ymaws.com/www.renewableuk.com/resource/collection/AE19ECA8-5B2B-4AB5-96C7-ECF3F0462F75/Offshore_Marine_HealthSafety_Guidelines.pdf

tričnom energijom i za rad u zatvorenim prostorima. Vrste izazova s kojima se susreću radnici koji održavaju su raznolike i povezane koliko s izazovima povezanim sa samom instalacijom, toliko i s vanjskim uvjetima povezanim sa okolišem i vremenskim uvjetima, koji mogu biti izuzetno teški, posebno na moru. Ako se pokretni dijelovi turbine ne zaštite pravilno, mogu izazvati teške ozljede, poput zdrobljenih prstiju ili ruku, amputacije, opekotina ili ozbiljnih ozljeda oka koje mogu dovesti do sljepoće. Pristup vrhu tornja također znači uspon vrlo visokim okomitim ljestvicama (npr. visine do 80 metara) ukoliko nema dizala. Radnici se često moraju popeti nekoliko puta tijekom smjene. To stvara veliko fizičko opterećenje i može rezultirati mišićno-koštanim poremećajima i fizičkom iscrpljenošću. Neophodan je određeni stupanj kardiorespiratorne kondicije i snage u udovima. Oprema za zaštitu mora biti dizajnirana za ekstremne okolišne uvjete.

Posebno je važno pratiti izloženost radnika plinovima i prašini tijekom rada u zatvorenim prostorima. Svaki tehničar za održavanje koji ulazi u ograđeni prostor mora imati prijenosni monitor plina i mora testirati uzorke zraka prije ulaska u zatvoreni prostor. Dobiveni rezultati upozoravaju na višestruke rizike zbog ulaska u ograničeni prostor zbog razine zapaljivih plinova. Standardni detektor za četiri plina uključuje senzore za nadziranje kisika, vodika, ugljičnog monoksida i sumporovodika. Za ulaz u ograničeni opasan prostor, poslodavac mora izdati pismeno dozvolu za ulazak. Ovo dopuštenje sadržava pojedinosti o koracima koje je potrebno poduzeti kako bi se prostor osigurao prije i za vrijeme ulaska. Obuka o tome kako se nositi s tim rizicima i opasnostima unutar zatvorenog prostora i upotrebi mjerne opreme je najvažnija za sve radnike na održavanju.¹⁷

6. IDENTIFIKACIJA OPASNOSTI I PROCJENA RIZIKA

Obzirom na usvajanje novih tehnoloških trendova i u području razvoja vjetroelektrana, javljaju se i nove opasnosti za radnike u području osiguranja života i zdravlja. Zbog toga su identifikacija opasnosti te procjena rizika od izuzetne važnosti za kvalitetno odrađen posao uz zdrave osposobljene radnike. Cilj uputnika za provjeru (Check liste) je pomoći u identificiranju potencijalnih opasnosti za radnike koji se bave aktivnostima vezanim uz sektor energije vjetra. U njemu se razmatraju aktivnosti i posebne opasnosti za radnike tijekom cijelog životnog ciklusa vjetroelektrana od proizvodnje i transporta dijelova, preko njihove ugradnje, rada i održavanja, do hitnog

¹⁷ Ibid.

spašavanja i obrade otpada. Upitnici za provjeru nemaju namjeru pokriti sve rizike povezane sa životnim ciklusom svake vjetroelektrane, već pomoći u pokretanju procesa identifikacije opasnosti i primjeni učinkovitih mjera prevencije. Za procjenu složenijih rizika mogu biti potrebne dodatne informacije ili pomoć stručnjaka. Upitnik treba prilagoditi svakom radnom mjestu i karakteristikama radne snage jer specifično okruženje i osoblje mogu imati svoje posebne potrebe. Iz praktičnih i analitičkih razloga, ovakvi upitnici za provjeru predstavljaju probleme/opasnosti odvojeno, ali na radnim mjestima oni se mogu međusobno ispreplesti. Stoga se moraju uzeti u obzir interakcije između različitih identificiranih problema ili čimbenika rizika.¹⁸ Važna pitanja koja treba riješiti:

- Jesu li menadžeri i radnici svjesni potencijalnih rizika povezanih s različitim aktivnostima u životnom ciklusu vjetroelektrana i jesu li predani smanjenju tih rizika?
- Potiče li organizacija radnike da prijavljuju probleme i uključuje ih u aktivnosti rješavanja problema?
- Jesu li radnici odgovarajuće obučeni i je li nadležna osoba provela procjenu rizika?
- Upravljaju li se prijavljenim slučajevima nesreća i incidenata?
- Kako se ocjenjuje i prati učinkovitost poduzetih mjera za sprječavanje rizika?

7. BUDUĆE AKTIVNOSTI

Kako se sektor vjetra brzo razvija, postoji potreba da se i zaštita zdravlja i sigurnost radnika također nastavi razvijati i time osigura visoki sigurnosni standard. Neki od izazova s kojima će se sektor energije vjetra morati suočiti prilikom razvoja i poboljšanja razine zaštite zdravlja na radu i sigurnosti uključuju sljedeće procese:¹⁹

7.1. Komunikacija

Utvrđena je potreba za uspostavljanjem strategija koje će omogućiti svim radnicima, dobavljačima i posjetiteljima da budu informirani o zaštiti

¹⁸ OSHA Hazard identification checklist: occupational safety and health (osh) risks in the wind energysector <https://www.google.hr/search?q=osha+E-facts+80>

¹⁹ <https://osha.europa.eu/en/publications/occupational-safety-and-health-wind-energy-sector/view>

zdravlja i sigurnosti na radu, primjerice što učiniti u slučaju incidenta ili nesreće.

7.2. Dijeljenje podataka

Informacije o zaštiti na radu moraju se efikasnije dijeliti. Što je više informacija o zaštiti zdravlja i sigurnosti na radu (na primjer – o statistikama nesreća), to će omogućiti da više organizacija uče iz međusobnih iskustava.

7.3. Obuka

Standardizirani programi i usklađivanje certifikata o osposobljavanju odnosno odgovarajućeg obrazovnog sadržaja smanjuju troškove i gubitak vremena uz povećanje mobilnosti radne snage.

7.4. Kompetencija

Obuka je učinkovita ukoliko su osigurani načini provjere osposobljenosti radne snage za zaštitu na radu, uključujući i dobavljače.

7.5. Dizajn

Mnogi rizici u području zaštite na radu u sektoru energije vjetra dolaze iz faze dizajniranja. Prevencijom kroz dizajn, zaštita zdravlja i sigurnost na radu će biti ugrađena u najranijim fazama projekta vjetroelektrane.

7.6. Usklađivanje postupaka i smjernica

Rad na usklađivanju smjernica dovodi do poboljšanja najboljih praksi u industriji čime se osigurava nesmetano angažiranje radnika na međunarodnoj razini bez gubljenja vremena i novca.

7.7. Poticanje zapošljavanja

Očekuje se manjak kvalificiranih radnika koji imaju malo ili nimalo iskustva na području zaštite zdravlja i sigurnosti na radu s kojima će se suočiti prilikom rada na vjetroelektranama. Potreban je niz akcija za poticanje zapošljavanja i rješavanje nedostatka odgovarajućih vještina.

8. ZAKLJUČAK

Situacija danas u svijetu uzrokovana klimatskim promjenama utječe na nužnost kontinuiranog prelaska s fosilnih goriva na druge oblike energije, prije svega na električnu energiju iz obnovljivih izvora energije. Osnovni izvori obnovljive energije su vjetar, sunce i geotermalni izvori.

U EU se trenutno provodi opsežno istraživanje u području energije vjetra. Iako zaštita zdravlja i sigurnost na radu sama po sebi nema istaknuto mjesto u trenutnom istraživačkom planu, neka istraživanja na njega će sigurno utjecati. Obzirom na nedostatak podataka o izloženosti radnika riziku, potrebno je više istraživanja temeljenih na zanimanjima kako bi se sektor energije vjetra prepoznao kao siguran i odgovoran sektor u kojem treba raditi.

Potrebna su posebno istraživanja na utjecaj radnih aktivnosti na dugoročnu karijeru i zdravlje svih radnika, na nove kombinacije tradicionalnih rizika u novom okruženju, uključujući buku, vibracije, elektromagnetsko zračenje, uporabu opasnih tvari i sindrom vjetroelektrana te uporabu nanomaterijala i eventualno drugih novih tvari s nepoznatim utjecajem na zdravlje.

Abstract:

DANGER IDENTIFICATION IN THE PRODUCTION, OPERATION AND MAINTENANCE OF WIND POWER TURBINES

The paper presents the dangers to occupational health and safety that may arise during the production, operation and maintenance of wind turbines. Namely, technologies related to the field of wind turbines are developing at an incredible speed, turbines are of ever larger dimensions and ever greater individual power. However, although wind turbines are among the “green” energy producers, they pose significant risks to workers. Often workers are not sufficiently trained to work safely, are exposed to many new risks and are not sufficiently aware of all the dangers that can result in serious injuries, death and occupational diseases. They work at height, in confined spaces with mechanical hazards and electric hazards. They usually work in isolated areas, are often surrounded by the sea and exposed to bad weather and strong winds. Therefore, it is necessary to identify dangers and assess risks when designing wind turbines, and later during production, operation and maintenance. To this end, checklists are drawn up to help ensure optimal working conditions.

Key words: wind power turbines, danger identification, risk assessment, occupational health and safety.

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UTJECAJ INFORMACIJSKOG SUSTAVA „ARKOD“ NA KVALITETU POSLOVANJA I RAZVOJ POLJOPRIVREDNIH GOSPODARSTAVA U REPUBLICI HRVATSKOJ

THE INFLUENCE OF THE “ARKOD”
INFORMATION SYSTEM ON THE QUALITY OF BUSINESS
AND THE DEVELOPMENT OF AGRICULTURAL
HOLDINGS IN THE REPUBLIC OF CROATIA

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SAŽETAK

Tema rada je istražiti te analizirati navedeni informacijski sustav te njegov utjecaj na kvalitetu organizacije poslovanja te razvoj poljoprivrednih gospodarstava na području Republike Hrvatske. Istraživanje će biti usmjereno prema analizi ključnih parametara uspješnosti takvih informacijskih sustava kao i analizi svih nedostataka koji se javljaju prilikom korištenja i implementacije takvih sustava u području planiranja i organizacije poslovanja. Kroz informacijski sustav „ARKOD“ poljoprivredni proizvođači u Republici Hrvatskoj mogu u svakom trenutku saznati i provjeriti podatke o svojim parcelama. Upravo taj jednostavan pristup podacima o svojim proizvodnim površinama omogućuje im organizaciju i planiranje poslovanja. Cilj istraživanja je dobivenim rezultatima ukazati na probleme kod korištenja takvih informacijskih sustava te dati preporuke, odnosno smjernice, kako povećati uspješnost i kvalitetu poslovanja implementacijom takvih sustava u rad tvrtke ili gospodarstva.

Ključne riječi: informacijski sustav, kvaliteta poslovanja, gospodarstvo.

1. UVOD

Informacijska tehnologija¹ i njezina primjena postaje sve značajnijim elementom u postizanju konkurentnosti i efikasnog poslovanja suvremenih tvrtki. Zbog sve veće važnosti i sve češće primjene informacijskih tehnologija u poslovnom svijetu pa tako i u poljoprivredi, od velikog je značaja istražiti kakva su iskustva poljoprivrednika s korištenjem informacijskih sustava. Pored toga, potrebe za hranom izrazito se povećavaju, te je dobra organizacija ključna za uspješnost poslovanja svakog poljoprivrednog gospodarstva i izravno utječe na optimizaciju poljoprivredne proizvodnje po jedinici površine. Kroz informacijski sustav *ARKOD* poljoprivredni proizvođači u Republici Hrvatskoj mogu u svakom trenutku saznati i provjeriti podatke o svojim parcelama. Upravo taj jednostavan pristup podacima o svojim proizvodnim površinama omogućuje im organizaciju proizvodnje u vidu planiranja sjetve, izračuna zasijanih i obrađenih površina, lokacija proizvodnih površina i dr. Iz tog razloga je važno imati u primjeni takav informacijski sustav te uvidjeti sve njegove prednosti te ukoliko ima nedostataka raditi na tome da se nedostaci isprave.

1.1. Predmet, ciljevi i hipoteze istraživanja

Predmet rada je istražiti pomaže li *ARKOD* informacijski sustav poljoprivrednicima u organizaciji i planiranju poslovanja/proizvodnje na njihovim gospodarstvima te koje su eventualne mogućnosti za poboljšanje sustava. Uz to, istraživanje ima zadatak i analizirati i izazove poljoprivrednika te uvidjeti koje su prilike za poboljšanje informacijskog sustava te s kojim problemima se suočavaju hrvatski poljoprivrednici prilikom korištenja *ARKOD* informacijskog sustava. U radu je obrađena tematika vezana uz informacijski sustav *ARKOD*, njegov značaj za razvoj poljoprivrednih gospodarstava u Republici Hrvatskoj na temelju mišljenja njegovih krajnjih korisnika, a to su hrvatski poljoprivrednici.

Cilj istraživanja je prikazati i utvrditi na koji način informacijski sustav *ARKOD* pomaže poljoprivrednicima u organizaciji poljoprivredne proizvodnje na njihovim gospodarstvima. Pored toga, cilj je i utvrditi koje su eventualne mogućnosti za poboljšanje već spomenutog informacijskog sustava, odnosno utvrditi sve prednosti i nedostatke korištenja takvih sustava.

¹ Josip Müller, „Upravljanje informacijskom tehnologijom u suvremenim tvrtkama te hrvatska poslovna praksa korištenja informacijskih tehnologija“, *Ekonomski pregled*, 2001.

Hipoteze:

- H1 Svim poljoprivrednicima informacijski sustav *ARKOD* pomaže u organizaciji proizvodnje.
- H2 Više od 50% ispitanih poljoprivrednika predlaže neke promjene u informacijskom sustavu *ARKOD*.

1.2. Metodologija istraživanja

Metode² koje su korištene u istraživanju su u prvom redu metoda anketnog upitnika koja je provedena na poljoprivrednicima koji koriste navedeni informacijski sustav. Ispitivanje je provedeno na uzorku od 52 ispitanika. Anketa je provedena online putem i to prilikom odrađivanja stručnih kontrola ovlaštenog kontrolnog tijela u Republici Hrvatskoj. Online anketiranje provodilo se pomoću društvene mreže *Facebook* gdje se u tzv. *Grupama* poput grupe „Plodovi zemlje“ na jednom mjestu nalazi veliki broj poljoprivrednih proizvođača s područja Republike Hrvatske. Ispitivanje prilikom stručnih kontrola ovlaštenog kontrolnog tijela za ekološku proizvodnju obavljeno je na način da je nakon obavljenih stručnih kontrola poljoprivrednicima ponuđena anketa na ispunjavanje. Takvim provođenjem postupka anketiranja anketirani su isključivo ekološki poljoprivredni proizvođači. Anketa je podijeljena u 5 cjelina: socio-demografske značajke, opća pitanja, odgovori prema Likertovoj ljestvici, odgovori na zaokruživanje i odgovori slobodnog tipa. Prilikom obrade podataka dobivenih Likertovom ljestvicom, stupnjevi se kodiraju brojevima od 5 do 1, pri čemu se brojem 5 označava najpozitivniji stav, a brojem 1 najnegativniji. Ako se brojem 5 označava najpozitivniji stav, važno je znati da osoba ima pozitivan stav prema određenoj izjavi samo ako se slaže s pozitivnom ocjenom ili ako se ne slaže s negativnom ocjenom. Za negativne izjave vrijedi obrnuto. Jednostavno rečeno, potpuno slaganje s pozitivnom izjavom ili potpuno neslaganje s negativnom izjavom dobivaju ocjenu 5.

Nakon provedbe ankete, koristi se statistička obrada dobivenih rezultata istraživanja koji su prikazana grafički te dodatno objašnjeni.

² Miroslav Žugaj, Ksenija Dumičić, Vesna Dušak, *Temelji znanstvenoistraživačkog rada*, TUVA, Varaždin, 2006.

2. INFORMACIJSKI SUSTAVI I DIGITALNE TEHNOLOGIJE U POLJOPRIVREDI

Informacijski sustavi u današnje vrijeme nalaze se u svakom segmentu gospodarstva i praktično su neizostavni dio bilo kojeg dijela poslovanja. Karakterizira ih utjecaj na brze promjene u organizaciji poslovanja s ciljem utjecaja na što bolju konkurentnost. Upravo korištenje informacijsko komunikacijske tehnologije (*ICT*), a time i informacijskih sustava, promijenile su dosadašnje razumijevanje poljoprivrede. Poljoprivreda se korištenjem takve tehnologije radikalno promijenila i traži sve više znanja iz tog područja kako bi omogućila poljoprivredniku opstanak na tržištu koje je sve zahtjevnije.

Digitalne tehnologije³, zbog svoje sveprisutnosti, prenosivosti i mobilnosti razvijaju poljoprivredu i mogu biti korištene na različite načine kako bi se poboljšala učinkovitost u proizvodnji. Osim kvalitetnog informacijskog sustava za razvoj poslovnog sustava, u ovom slučaju poljoprivredne proizvodnje, ključna je i informacija. U posljednjih 40-ak godina informacija je postala⁴ ravnopravni šesti organizacijski resurs uz onih pet tradicionalnih: ljude, strojeve, novac, materijale i menadžment. Značenje informacije kao informacijskog resursa svakim danom sve više raste. Te ključne informacije poslovnim sustavu pruža upravo informacijski sustav.

Kad se govori o poljoprivredi, uobičajeno je upotrijebiti frazu “tvornica na otvorenom”, sugerirajući pri tom na njenu izloženost klimatskim (ne)prilikama, a u cilju dokazivanja kako je poljoprivreda⁵ izričito rizična djelatnost. Danas je prije svega zahvaljujući informacijskoj tehnologiji, moguće izraditi odgovarajuće informacijske sustave s bazama podataka na temelju kojih je onda moguće na relativno jednostavan i brz način izrađivati brojne tematske karte, te time doći do neophodnih prostornih informacija za donošenje ispravnih odluka u sklopu planiranja, korištenja i gospodarenja zemljištem.

2.1. Informacijski sustav *ARKOD*

Republika Hrvatska je u srpnju 2009. godine uvela informacijski sustav *ARKOD* (en. *LPIS*) kako bi ažurirala stanje zemljišnih parcela i kako bi se uspješno zaključilo i ovo poglavlje. *ARKOD* je nacionalni sustav za identifi-

³ Ante Galić, Stjepan Plietić, „New technologies and approaches in the processing of agricultural products, Agri – 2021“, 2nd Edition of Global Agriculture Conference - Abstract book, 2021.

⁴ Vlatko Čerić, Mladen Varga, *Informacijska tehnologija u poslovanju*, Sveučilište u Zagrebu, Zagreb, 2004.

⁵ Mario Njavro, Tajana Čop, *Upravljanje rizikom u poljoprivredi*, Mate d.o.o., Zagreb, 2021.

kaciju zemljišnih parcela (*eng. Land Parcel Identification System - LPIS*), odnosno evidencija uporabe poljoprivrednog zemljišta u Republici Hrvatskoj.

Cilj informacijskog sustava *ARKOD*-a je dobiti jasnu sliku koliko se zemljišta u Hrvatskoj koristi za poljoprivrednu proizvodnju, bez obzira na kulture koje se na njima uzgajaju te omogućiti poljoprivrednicima lakši i jednostavniji način podnošenja zahtjeva za poticaje kao i njihovo transparentno korištenje. Njime se također uspostavlja baza podataka koja evidentira stvarno korištenje poljoprivrednog zemljišta. Sustav za identifikaciju zemljišnih parcela (*ARKOD*) uspostavljen je na temelju karata, zemljišnih knjiga te drugih kartografskih referenci koje služe kao podloga za interpretaciju i određivanje površina poljoprivrednog zemljišta poljoprivrednih gospodarstava. Koristi se metoda računalnog *GIS-a* (geografsko informacijski sustav), tj. grafička evidencija zemljišnih resursa poljoprivrednika na temelju kojih će se u budućnosti izrađivati zahtjevi za plaćanje prema površini.

Informacijski sustav *ARKOD* uspostavljen je na temelju geo-referencirane digitalne ortofoto karte (*DOF5*) u mjerilu 1:10000. Kao pomoćni izvori prostornih podataka još se koriste⁶:

- Digitalni katastarski planovi (*DKP*) – služe kao kontrolni podaci kod interpretacije zemljišta na *DOF-u*, te kao veza s Upisnikom poljoprivrednih gospodarstava u kojem postoje alfanumerički podaci katastarskih čestica;
- Topografske karte (*TK25*) – služe kao dodatni podaci tijekom postupka digitalizacije te za bolju orijentaciju i snalaženje u prostoru na *DOF-u*;
- Digitalni model reljefa (*DMR*) – služi za definiranje pojedinih atributnih podataka (primjerice za određivanje nagiba pojedinih poljoprivrednih površina, nadmorske visine, područja s težim uvjetima gospodarenja i ostalom);
- Podaci iz Središnjeg registra prostornih jedinica (*SRPJ*) – sadrže informacije o granicama Županija, Općina i gradova te katastarskih općina, a potrebni su za logističku potporu te organizaciju uspostave i održavanja sustava.

Sve navedene prostorne podloge trebaju biti dostupne za područje čitave države i sukladno zahtjevima EU zakonodavstva ne smiju biti starije od 5 godina. Informacijski sustav *ARKOD* funkcionira na načelu *GIS-a*, odnosno digitalne kartografije gdje se podaci o prostoru smještaju u formi digitalnih karata

⁶ Mladen Jurišić, Ivan Plaščak, „Metodologija izrade karata namjene za upravljanje resursima sa osvrtom na IACS/LPIS(ARKOD) i geotermalne izvore u GIS-u.“, Ekonomski fakultet u Osijeku, Osijek, 2012.

predstavljenih kao niz različitih tematskih slojeva. Pri tome se može prikazati samo digitalna orto-foto karta ili topografska karta, koje predstavljaju podlogu, a na njih se mogu pozicionirati ostali navedeni „slojevi“ koji su od interesa.

2.2. Kartografija kao osnova informacijskog sustava *ARKOD*

Kartografija⁷ se od geografije i geodezije razlikuje po objektu istraživanja. Objekt istraživanja geografije je izgled, sadržaj i značenje pojedinih dijelova površine Zemlje. Objekt istraživanja geodezije je izmjera Zemlje. Objekt istraživanja kartografije je pretvorba prostorne stvarnosti u grafički prikaz u ravnini. To znači da su objekti istraživanja kartografije pronalaženje najprikladnije kartografike i vrste kartografskog prikaza, kako bi taj prikaz ili znakovni model određenih vanjskih i unutrašnjih obilježja prostorno vezanih i položajno određenih objekata bio takav da kod korisnika može izazvati što bolju predodžbu prostorne stvarnosti.

Karta nije samo jednostavan crtež Zemljine površine, već znakovni model koji se izrađuje na temelju određenih matematičkih zakona koji predstavljaju posredan i postupan prijelaz s fizičke Zemljine površine na njen grafički prikaz u ravnini. Prvo se fizička Zemljina površina transformira na matematičku plohu – rotacijski elipsoid ili sferu ortogonalnim projiciranjem pomoću mreže točaka geodetske osnove koja omogućuje pravilan geografski smještaj i orijentaciju sadržaja karte u okviru neke koordinatne mreže. Nakon toga se vrši prijelaz s plohe rotacijskog elipsoida ili sfere u ravninu. Ta se preslikavanja nazivaju kartografske projekcije.

Ukratko, kartografske projekcije⁸ su matematički postupci koji omogućuju preslikavanje zakrivljene plohe (sfere ili rotacijskog elipsoida) zemlje i drugih nebeskih tijela u ravninu. Teorija kartografskih projekcija često se naziva i matematičkom kartografijom, a cilj izučavanja kartografskih projekcija je stvaranje matematičke osnove za izradu karata i rješavanje teorijskih i praktičnih zadataka u kartografiji, geodeziji, geografiji, astronomiji, navigaciji i ostalim srodnim znanostima.

2.3. Tlo kao baza primjene informacijske tehnologije u poljoprivredi

Tlo je važan prirodni resurs i zajedničko bogatstvo svakog naroda. Njegova uporaba, zaštita i zbrinjavanje regulirani su zakonom u Republici Hrvat-

⁷ Domagoj Zimmer, „Primjena digitalne kartografije u svrhu upravljanja biljnom proizvodnjom – (ARKOD)“, Sveučilište J. J. Strossmayera u Osijeku, Osijek, 2013.

⁸ Domagoj Zimmer, „Primjena digitalne kartografije u svrhu upravljanja biljnom proizvodnjom – (ARKOD)“, Sveučilište J. J. Strossmayera u Osijeku, Osijek, 2013.

skoj. Problem očuvanja tla i zaštite od nepoljoprivredne uporabe prisutan je u svim regijama Hrvatske. Stoga očuvanje i zaštita tla neizbježan su zahtjev racionalnog gospodarenja zemljištem. U Hrvatskoj se godišnje izgubi⁹ oko 6.700 ha poljoprivrednog zemljišta, što je puno s obzirom na ukupnu površinu zemlje, njezino stanovništvo i udio poljoprivrednog tla. Rezultati istraživanja i klasifikacija zemljišta za potrebe regionalnog planiranja temelje se na podacima o zemljištu dobivenim *GIS* informacijskom tehnologijom. Pedološki podaci digitalno su obrađeni programom *ArcInfo*, a podaci su prikladni za detaljnu obradu, brzo pronalaženje i interpretaciju. Digitalna obrada nudi više mogućnosti korištenja ovih podataka u različite svrhe. Osim izravnih podataka za potrebe regionalnog planiranja, pružaju se i drugi podaci za njihovu izravnu uporabu za poboljšanje tla i buduću uporabu zemljišta.

Kako je već istaknuto, od presudne važnosti je na jednostavan i brz način izrađivati baze podataka te na taj način doći do informacija potrebnih za donošenje ispravnih odluka u sklopu planiranja, korištenja i gospodarenja zemljištem. Uz sinergiju nadležnih institucija, regionalne i lokalne samouprave te potporu znanstvene zajednice *ARKOD* informacijski sustav je moguće unaprijediti u integrirani sustav upravljanja poljoprivrednim zemljištem koji bi mogao doprinijeti strategiji razvoja poljoprivrede u Hrvatskoj.

Preduvjet svim strukturnim mjerama u seoskom prostoru i poljoprivredi jest jasna i definirana zemljišna politika kojom se regulira uporaba, vlasništvo i tržište zemljištem. Takva politika mora imati stabilne sustave upravljanja zemljištem kao podršku njenom provođenju. Iako je prikupljanje i održavanje podataka o zemljištu skupo, dobar sustav upravljanja zemljištem donosi korist koja znatno premašuje troškove njegove uspostave. Mnogi autori¹⁰ ističu da nije osnovno pitanje mogu li si države priuštiti takav sustav, nego mogu li si priuštiti ne imati ga. Takav sustav zasnovan na katastarskoj čestici kao osnovnoj prostornoj jedinici, u kojemu se, osim katastarskih podataka, može evidentirati i niz drugih informacija u interesu korištenja i upravljanja zemljištem. Temelji se na jedinstvenom prostornom referentnom sustavu, što omogućava povezivanje podataka unutar sustava s drugim prostorno povezanim podacima.

⁹ Matko Bogunović, Željko Vidaček, Stjepan Husnjak, „Klasifikacija tla za potrebe prostornog planiranja u Hrvatskoj“, *Agronomski glasnik*, Vol. 63, No. 4-5, 2001, str. 171-180.

¹⁰ Peter Dale, John D. McLaughlin, „Land Administration“, *Oxford University Press*, Oxford, 2000.

3. REZULTATI ISTRAŽIVANJA

Za potrebe rada i testiranje postavljenih hipoteza, provedena je anketa s korisnicima, odnosno poljoprivrednicima, informacijskog sustava *ARKOD*. Postupkom anketiranja ispitano je ukupno 52 krajnjih korisnika informacijskog sustava *ARKOD*.

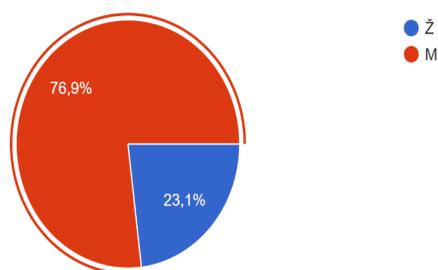
Anketa je provedena online pomoću društvene mreže *Facebook* gdje se u tzv. *Grupama* na jednom mjestu nalazi veliki broj poljoprivrednih proizvođača s područja Republike Hrvatske. Važno je naglasiti da se takvim provođenjem postupka ispitivanja anketiraju isključivo ekološki poljoprivredni proizvođači. Ispitanici nisu bili obvezni odgovoriti na sva pitanja. Nakon provedbe ankete, dobiveni rezultati istraživanja statistički su obrađeni, a u nastavku rada rezultati su prikazani grafički te dodatno tekstualno objašnjeni.

3.1. Socio-demografski podaci

Socio-demografski podaci u istraživanju su prikazani na sljedeći način. Od ukupno 52 anketirane osobe, njih 23% je ženskog spola, a 77% ispitanika je muškog spola, što je vidljivo iz prikaza na grafikonu 1.

Grafikon 1. Spolna struktura ispitanika

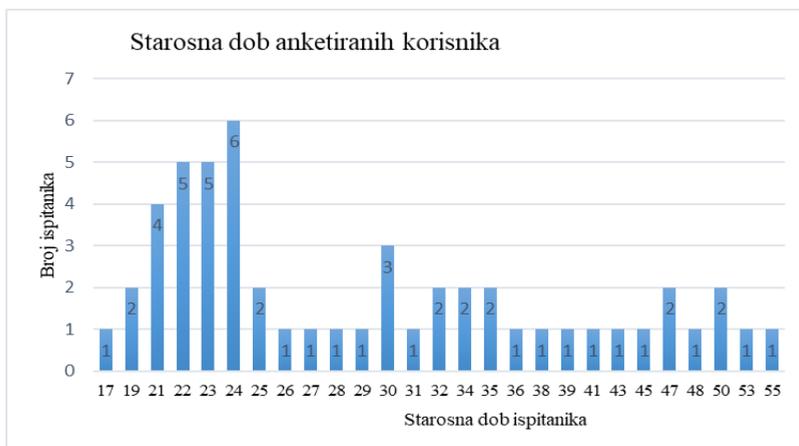
2. Spol:
52 odgovora



Izvor: Vlastito istraživanje.

Raspon godina anketiranih korisnika je od 17 do 55 godina i iz toga je vidljivo da su istraživanjem zahvaćene gotovo sve dobne skupine. Dobna struktura ispitanika prikazuje se grafikonom 2.

Grafikon 2. Prikaz starosne dobi anketiranih korisnika informacijskog sustava ARKOD



Izvor: Vlastito istraživanje.

S obzirom na to da je anketom obuhvaćen široki dobn raspon korisnika *ARKOD* informacijskog sustava, jasno je vidljivo da dob nije limitirajući faktor pri korištenju informacijskim sustavom *ARKOD* te da ga koriste poljoprivrednici svih dobnih skupina.

Nadalje, informacijski sustav *ARKOD* koristi se diljem RH što se vidi iz grafikona 3.

Grafikon 3. Prikaz broja ispitanika po županijama

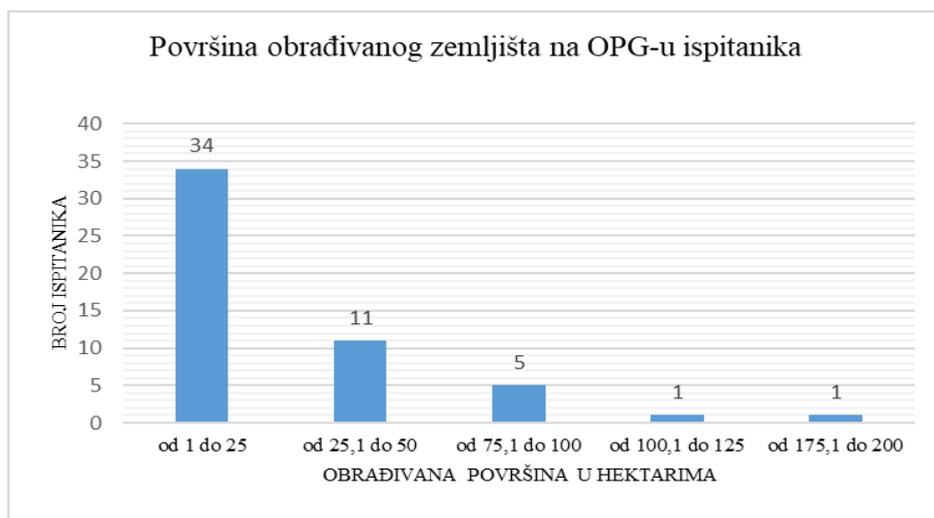


Izvor: Vlastito istraživanje.

Iz grafikona 3. vidljivo je da je postupkom anketiranja obuhvaćeno 13 županija što čini postotak od 61,9% od ukupnog broja županija u Republici Hrvatskoj. Najviše anketiranih korisnika informacijskog sustava ima sjedište OPG-a u Koprivničko-križevačkoj županiji, njih 23 što čini 44% od ukupnog broja ispitanika. Najmanje ispitanika ima sjedište OPG-a u Brodsko-posavskoj (1), Vukovarsko-srijemskoj (1), Karlovačkoj (1), Ličko-senjskoj (1), Požeško-slavonskoj (1) te u županiji Grad Zagreb (1).

Jedan od podataka koji je dobiven provođenjem ankete je također i veličina OPG-a izražena u hektarima poljoprivrednog zemljišta. Taj podatak izuzetno je važan jer se iz njega može iščitati korelacija korištenja informacijskog sustava *ARKOD* s obzirom na površinu poljoprivrednog zemljišta koju posjeduju odnosno obrađuju ispitanici. Odnos broja ispitanih korisnika s obzirom na površinu poljoprivrednog zemljišta koju obrađuju vidljiv je iz grafikona 4.

Grafikon 4. Prikaz površine obrađivanog poljoprivrednog zemljišta



Izvor: Vlastito istraživanje.

Iz grafikona 4 vidljiva je raspodjela broja ispitanih korisnika informacijskog sustava *ARKOD* s obzirom na površinu poljoprivrednog zemljišta koja se obrađuje na njihovom obiteljskom poljoprivrednom gospodarstvu. Najviše ispitanika (34) obrađuje između 1 i 25 hektara poljoprivrednog zemljišta dok

najmanje ispitanika obrađuje između 100,1 i 125 hektara (1) te 175,1 i 200 hektara (1) poljoprivrednog zemljišta. Iz grafikona je uočljivo kako informacijski sustav koriste poljoprivrednici bez obzira na površinu obrađivanog zemljišta. Jedan od razloga zbog čega čak 34 ispitanika obrađuju između 1 i 25 hektara zemljišta, a npr. tek 2 ispitanika više od 100 hektara zemljišta je taj da je prosječna veličina OPG-a prema Popisu poljoprivrede iz 2003. godine u Republici Hrvatskoj oko 2,6 ha.

3.2. Rezultati istraživanja zadovoljstva korisničkim sučeljem

Korisničko sučelje kod svih aplikacija i alata informacijske tehnologije od velike je važnosti. O korisničkom sučelju ovisi je li korištenje alata dobro ili ne, a u konačnici o njemu ovisi i stupanj korisnosti takvog alata. Stoga, je bilo važno provesti istraživanje o zadovoljstvu korisničkog sučelja navedenog informacijskog sustava kod korisnika.

ARKOD informacijski sustav ima u usporedbi s drugim kartografskim mrežnim servisima prilično malo funkcija. Razlog tome je taj što je taj alat napravljen za određenu usku uporabnu skupinu korisnika. Tokom provođenja ankete, 52 anketirana ispitanika svoje zadovoljstvo korisničkim sučeljem informacijskog sustava *ARKOD* izrazila su kako je prikazano u grafikonu 5.

Grafikon 5. Zadovoljstvo ispitanika korisničkim sučeljem



Izvor: Vlastito istraživanje.

Pitanje vezano za zadovoljstvo ispitanika korisničkim sučeljem glasi: „U kolikoj mjeri ste zadovoljni korisničkim sučeljem informacijskog sustava *ARKOD*?“. Od ukupno 52 ispitanika njih 19 (36,5%) u potpunosti je zadovoljno korisničkim sučeljem. Najveći broj ispitanika, njih 23 (44,2%) u velikoj mjeri je zadovoljno korisničkim sučeljem. Njih 6 (11,5%) djelomično je zadovoljno, četvero (7,7%) ispitanika u velikoj mjeri nije zadovoljno korisničkim sučeljem. Niti jedan ispitanik ne smatra kako je u potpunosti nezadovoljan korisničkim sučeljem.

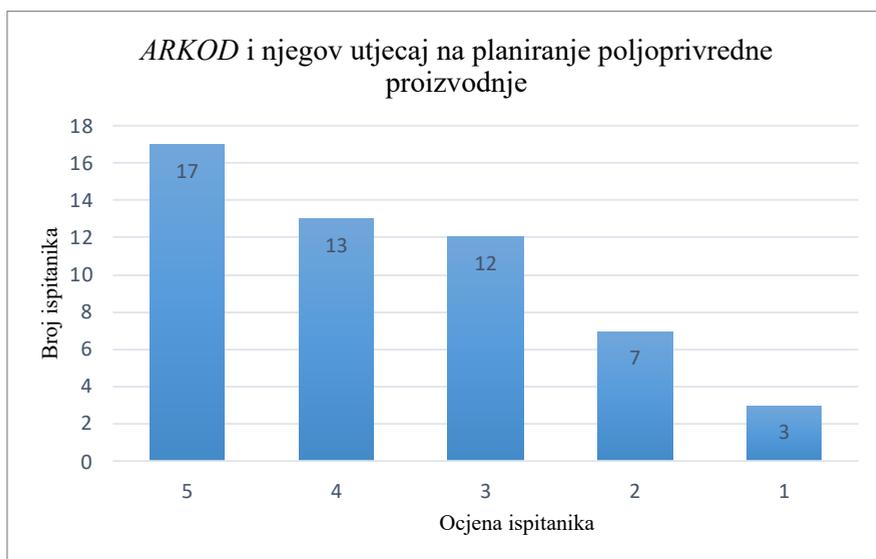
3.3. Utjecaj *ARKOD* informacijskog sustava na planiranje proizvodnje

Informacijsko komunikacijska tehnologija integrira uobičajene operacije s bazama podataka, kao što su pretraživanje, upiti ili statističke analize s jedinstvenim prednostima vizualizacije i prostorne analize koju donose karte. Ove mogućnosti izdvajaju geografsko informacijski sustav od ostalih informacijskih sustava i čine ga dragocjenim alatom za najrazličitije namjene i korisnike. Tehnologija geografskog informacijskog sustava (*GIS*) može se koristiti za znanstvena istraživanja, upravljanje resursima, imovinsko upravljanje, planiranje razvoja, kartografiju, planiranje puta, a samim time i na planiranje poljoprivredne proizvodnje.

Glavne značajke i prednosti korištenja *GIS*-a su: računalno potpomognuta produkcija karata, predefinirana izvješća, jednostavne analize i pretraživanja prostornih baza podataka, grafički podaci pohranjeni u specijalnim formatima datoteka, atributni podaci pohranjeni u bazama podataka itd. Takav sustav je jedan od najperspektivnijih informacijskih tehnologija današnjice. Njihovu primjenu treba očekivati tamo gdje je prostorne geometrijske podatke potrebno povezati s tekstualnim, odnosno atributnim podacima (podatci o vlasniku katastarske čestice, ime ulice, dozvoljena brzina kretanja i ostalo) i na temelju toga izvoditi potrebne analize i planiranja.

Slijedom toga, u istraživanju se posebna pažnja dala mišljenju ispitanika koliko takav informacijski sustav ima utjecaja na planiranje proizvodnje što je vidljivo iz grafikona 6.

Grafikon 6. Utjecaj na planiranje proizvodnje



Izvor: Vlastito istraživanje.

Od ukupno 52 ispitanika njih 17 smatra da informacijski sustav *ARKOD* u potpunosti pomaže pri organizaciji planiranja poljoprivredne proizvodnje na obrađivanim parcelama na gospodarstvu. Njih 13 smatra da *ARKOD* informacijski sustav pomaže u velikoj mjeri, 12 ih smatra da djelomično pomaže, 7 ih smatra da u velikoj mjeri ne pomaže, a 3 ispitana korisnika smatraju da u potpunosti ne pomaže u planiranju radova na parcelama. Iz dobivenih rezultata uočljivo je kako postoji prostor za poboljšanje *ARKOD* sustava. Iz rezultata istraživanja može se vidjeti da ispitanici imaju različita iskustva s korištenjem takvih informacijskih sustava, ali većina ispitanika se izjasnila kako takav sustav pomaže u organizaciji proizvodnje što u konačnici i ukazuje na važnost proučavanja i nadogradnje takvih informacijskih sustava.

3.4. Izazovi i prijedlozi za poboljšanjem informacijskog sustava

Na pitanja koje funkcije *ARKOD* informacijskog sustava koriste, ispitanici su odgovorili različito. Međutim, iz odgovora ispitanika vidljivo je kako najčešće koriste sljedeće funkcije sustava:

- Izmjera površina parcele;
- Podaci o vlasniku parcele;

- Granice parcela;
- Podaci o katastarskim česticama;
- Općeniti podaci o pojedinim parcelama.

Najčešći nedostaci prilikom korištenja informacijskog sustava su sljedeći:

- Nedovoljna geografska preciznost informacijskog sustava;
- Nedovoljno često ažuriranje (u smislu svježih avionskih snimaka kako bi bilo vidljivo realno stanje na terenu);
- Nedovoljno pojednostavljeno korisničko sučelje.

S obzirom na najčešće izazove s kojima se susreću ispitanici vidljivo je koje dijelove sustava je potrebno približiti korisniku. Zatim, potrebno je češće ažurirati kartografske podatke kako bi oni prilikom korištenja sustava dobili uvid u realno stanje na terenu, a ne primjerice uvid u stanje na terenu kakvo je ono bilo prije 6 mjeseci. Pored toga, predlažu se sljedeće mjere:

- Izradu mobilne aplikacije s mogućnošću određivanja trenutne lokacije na kojoj se mobilni uređaj odnosno poljoprivrednik nalaze;
- Mogućnost evidentiranja obavljenih poljoprivrednih radova;
- Povezivanje s već postojećim aplikacijama namijenjenim poljoprivrednicima;
- Uvođenje meteoroloških podataka u aplikaciju.

Prijedlozi anketiranih korisnika uvelike bi olakšali poljoprivrednicima samu poljoprivrednu proizvodnju. Uzimajući u obzir rezultate ovog istraživanja te provođenjem dodatnih istraživanja, *ARKOD* informacijski sustav bi zaista mogao postati integrirani sustav upravljanja zemljištem. Korist od toga ne bi imali samo poljoprivredni proizvođači već i same institucije nadležne za nadzor poljoprivredne proizvodnje koje bi mogle kontrolirati i nadzirati poljoprivrednu proizvodnju. Suradnjom poljoprivrednika i institucija moglo bi se postići da se *ARKOD* informacijski sustav poboljša i u potpunosti prilagodi korisnicima. Razvojem takvog sustava povećao bi se njegov utjecaj na poljoprivrednu proizvodnju koja bi lakšom i bržom organizacijom postala profitabilnija pa bi to imalo utjecaja i na cjelokupno gospodarstvo.

4. ZAKLJUČAK

Iz rezultata istraživanja može se zaključiti kako postoji značajan prostor za napredak i razvoj *ARKOD* informacijskog sustava. Prije samog istraživanja postavljene su dvije hipoteze. Prva, da informacijski sustav pomaže svim poljoprivrednicima u organizaciji poljoprivredne proizvodnje, a druga,

da više od 50% ispitanih korisnika predlaže neke promjene u navedenom informacijskom sustavu.

Prema rezultatima istraživanja, grafikon 6, čak preko 80% ispitanika ističe kako ima takav informacijski sustav pomaže u planiranju i organizaciji proizvodnje čime je dokazana prva hipoteza. Najčešći razlog zbog kojeg im takav sustav ne pomaže u organizaciji poljoprivredne proizvodnje, je složenost takvog sustava za korištenje pa samim time i njegova neprilagođenost korisnicima svih životnih dobi, ali je to ipak manji broj ispitanika. Druga hipoteza je isto tako potvrđena, jer više od 50% ispitanika predlaže neke promjene u *ARKOD* informacijskom sustavu kako bi isti bio još bolji i jednostavniji za korištenje. Prijedlozi za poboljšanje zaista su konstruktivni i svakako bi ih trebalo uzeti u obzir jer su hrvatski poljoprivrednici ljudi koji sami najbolje znaju koje promjene su im potrebne. Da bi se navedene promjene implementirale u sustav, potrebno je uložiti energiju i resurse ne samo od strane poljoprivrednika nego od strane institucija pa i Vlade RH. Stoga je od posebne važnosti potrebna suradnja između institucija i poljoprivrednika. Provođenjem istraživanja stječe se dojam kako institucije u Republici Hrvatskoj, zadužene za poljoprivrednu proizvodnju, imaju premalo razumijevanja za poljoprivredne proizvođače u tom segmentu. Dakle, potrebno je stvoriti sinergiju između hrvatskih poljoprivrednika s ciljem razvoja hrvatske poljoprivrede te u to posebno uključiti obrazovne institucije.

Poljoprivreda je jedna od najvažnijih grana gospodarstva svake države. Zbog toga je potrebno raditi na razvoju hrvatske poljoprivrede i njezinoj informatizaciji, jer digitalna poljoprivreda je budućnost proizvodnje. Shodno tome, općenito se može zaključiti, da *ARKOD* informacijski sustav konstantno treba poboljšavati i na njemu raditi. To se posebno odnosi na središnji poljoprivredni informacijski sustav u Republici Hrvatskoj s ciljem razvoja poljoprivrede koja je prerasla granice klasične poljoprivrede te koja traži nova znanja i nove vještine koje će biti implementirane u sustav poslovanja, a slijedom toga i u sustav obrazovanja.

Abstract:

THE INFLUENCE OF THE “ARKOD” INFORMATION SYSTEM
ON THE QUALITY OF BUSINESS AND THE
DEVELOPMENT OF AGRICULTURAL HOLDINGS
IN THE REPUBLIC OF CROATIA

The topic of the paper is to research and analyse the information system and its impact on the quality of business organization and on the development of agricultural economy in the territory of the Republic of Croatia. The research will be focused on the analysis of key performance indicators of such information system also analysis of all defects that occur during the use and implementation such information system in the area of business planning and organization. Through the information system „ARKOD“ agricultural producers in the Republic of Croatia can at any time identify and check the data about their parcels. That easy access to data on their production areas enables them to organize and plan their business. The aim of the research is, with obtained research results, to point out the problems with the use of such information systems and to make recommendations or guidelines on how to increase the success and quality of business by implementing such system in the work of company or economy.

Key words: information system, business quality, economy.

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TRANSFORMATION AND DIGITALIZATION REQUIRE A DEEP UNDERSTANDING OF QUALITY AND CULTURE

TRANSFORMACIJA I DIGITALIZACIJA ZAHTIJEVAJU
DUBOKO RAZUMIJEVANJE KVALITETE I KULTURE

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ABSTRACT

Transformation and all the similar names we use to address how the organizations should approach the evolution we face is not only about technology. We all know that. But all kinds of assessments show the same: transformations' fallouts are almost always on the cultural side. The main reason is not that people don't have the capabilities to understand and implement consistently. Maybe, we are not addressing the organizational capabilities needed enough. This presentation focuses on the organizational and individual capabilities needed for a successful transformation in down-to-earth organizations. And on how the Human Resources and Quality roles could help.

Key words: quality, transformation, digitalization, quality culture.

1. TECHNOLOGY, TRANSFORMATION AND MINDSET

We all agree we live in a moment where innovation, transformation and digitalization are critical. It is common understanding that change will not stop whether it is social or technological. And it is common understanding that all changes bring resistance.

This resistance usually prevents projects from achieving goals, timelines and budgets. But is it real? Even if this resistance to change exists, does it really impact projects' quality, cost and schedule that much? If so, how should we manage it and who should do it? Let's see.

2. TALKING ABOUT TECHNOLOGY

Industry 4.0 is a revolution driven by the exponential growth of disruptive technologies and the changes those technologies bring to the workplace, to the workforce and to all types of markets.

According to an article published by McKinsey¹ the crisis presents an opportunity but not many people feel prepared enough to take it. Executives agree on Innovation being critical and 90% of them say they need to change the way of doing business. But only 21% feel they are sufficiently prepared and have the experience, resources and commitment to do so. Moreover, only 6% are satisfied with their innovation performance.

You can hear hundreds of companies talking about Quality 4.0, but a recent joint study from the Boston Consulting Group, the American Society for Quality and the Deutsche Gesellschaft für Qualität² shows that only 16% of companies are using and 20% are planning to adopt Quality 4.0.

We all know that technology is central nowadays. But the obsession with technology can turn it into a race to incorporate the latest advancements regardless of whether they add value or not. It is not a matter of using apps or updating software. It's a matter of adding value for a stakeholder (customer, user, employee, supplier, community where we are located; all those who are somehow impacted by our products, services and operations).

We can learn something from the evolution of technology, though. Innovation doesn't come from a substantial improvement in a specific field, but from working on ecosystems and integrating the improvements

¹ McKinsey & Company, "Innovation in a crisis: Why it is more critical than ever," 2020.

² "Quality 4.0", Boston Consulting Group, American Society for Quality and the Deutsche Gesellschaft für Qualität. <https://asq.org/quality-resources/quality-4-0>.

achieved in different fields, such as Artificial Intelligence, Mechatronics, sensors, and object recognition. We should take advantage of this example and use the concept in our own business: during a transformation we need to integrate not only efforts, but concepts.

3. TALKING ABOUT TRANSFORMATION

Jack Welch once remarked, “If the rate of change on the outside exceeds the rate of change on the inside, the end is near”. As McKinsey defines it, a transformation³ ”is an endeavor that involves the whole organization with high intensity in an attempt to improve the business results and organizational health”.

I find 5 keys for a successful transformation:

- *Understanding* that our future is in trouble if we do not (truly) change.
- *Belief* and total commitment on why we should embark on it.
- *Ambition*, even though it’s painful, because if not we are only improving.
- *Digitalization* because is the only way to connect people and things in real time.
- *Total involvement* of, at least, 100% of the key personnel and 30% of employees.

Leading a transformation requires total *accountability, commitment* beyond all that is imaginable, a *strategy and a plan* with clear *technical and social milestones*, a *sponsor coalition* and *pain* yes, if it is a transformation there will be non-desired effects.

4. TALKING ABOUT MINDSET

But those transformation’s keys and requirements put a great challenge to Owners, Boards and Managers: people need to Think, Experiment and Learn together. This means uninhibited people. Many people don’t show their creative ideas because they are afraid of driving fear or shame. We need to create “freedom to dream, create and do”⁴. And we need people working in integrated ways. Not just teamwork or collaboration, we need to bring together and unite ideas, functions, processes, and efforts to create more and new value for all stakeholders.

³ McKinsey & Company, “Innovation in a crisis: Why it is more critical than ever,” 2020.

⁴ Imagineers, “The Imagineering Way”, Disney Editions, 2003.

Therefore, we need a new set of metrics different from the usual KPIs. We need to learn how to measure and evaluate how mindset evolves. And a new perspective on how to measure business and strategy that is not only for Start-Ups.

5. CULTURE IS THE KEYWORD

Experience, seniority, and knowledge need to be reconsidered and re-signified. In this continuous changing environment *what* we will be able to do in the future and *how* we will be able to think is more important than the things we have already done. As Bob Gurr, Original Imagineer, Disney⁵, stated “*I am happy I did not know it was impossible*”.

People should be able to believe, think and act differently, to understand the customer, provider, employees and all the rest of the stakeholders. To feel free to experiment new ideas and ways of working. And, more importantly, to learn from what did not work as planned, and from what did work as planned.

We need to understand that to grow is not what most matters, but to develop. Gaining new skills to grow in the present and future environment. New competencies, new technical skills and mainly, new social skills are to be put in place to allow such development.

In the 2020 Automotive Industry Report Insights on Excellence 26% of those surveyed said that Data Analytics is the skill that needs more improvement within the workforce. Another 25% said Artificial Intelligence & Machine learning is the one. But similar percentages voted for Change Management and the ability for working with cross functional teams 25% each.⁶

Culture is not so intangible as you might think. Culture is the way people react, what they say, how they behave when a driver takes place. During transformations, this means what people think about it, what they believe, how much they trust in its purpose and potential benefits, how much they will do and say in favor, and how much they will be willing, and able, to sustain changes.

For example, customer and users’ expectations and needs will continue to change at an increasing rate. What excites them today won’t do so tomorrow. So, we need to be alert because we could be designing and working on goods, services and priorities that are not, or won’t be soon, those of bigger impact for them. So, we have 3 key issues to consider:

⁵ Ibid.

⁶ Automotive Industry Report Insights on Excellence. ASQ Excellence, 2021.

- *First, we need to understand who the stakeholder is.* See her, see him or see it. Not only listen to them. It's being them. Getting into their skin.
- *Second, we need to understand his/her expectations and needs from her/his own perspective.* Both, explicit and implicit. Not what our resources let us do or our knowledge lets us think we can do, but what we should do.
- *Third, we need to understand them all along the interactions and moments of truth* that our stakeholder has with everything we do. It's his/her own perception, evaluation and emotions that counts. Moreover, even when our company name is not in his or her mind yet.

We need to understand them. Be close, with total honesty listen, look at him/her, design his/her experience with bold ambition and create a coherent strategy and plan.

As John Guaspari wrote in his book "*I know it when I see it*"⁷, more than 40 years ago, and Steve Jobs clearly stated, you will really know if you are satisfying those expectations and needs when they can touch, interact, use, feel whatever it is that you are delivering.

But here is a catch. To have them interact, you must first act. And nowadays things change so fast that you must think and act faster. And analyze and debate using data. Data coming from experimentation. Data coming from short and rapid cycles of understanding, creating experimenting, and learning with your customer, user, employee or whoever your stakeholder is.

But we can't expect continuous innovation, experimentation, learning and rapid responses in a culture where an undesirable result from an experiment is considered a failure. Where an error means weakness. An experiment has no good or bad results! Just expected or not expected ones. We need a culture consistent with our desires. Where results drive learning, not punishment.

⁷ John Guaspari, "I Know it when I see it", American Management Association, 1985.

6. RESISTANCE TO CHANGE

So, to have significant transformations we must change how things are done. These are the “technical aspects”. But these changes also modify things with which people are comfortable with or, at least, accustomed to. Even those people participating in the generation or implementation of the new ways of doing business, do they adopt immediately new habits and behaviors?

6.1. Individual Resistance

Usually, when we talk about changing, innovating, a quick respond to a customer request, about integrating efforts, we find the individual resistance. That resistance coming from the people whose behavior is asked to change. I find 3 main competencies we, as individuals facing a never-ending wave of changes, should gain.

- *First, we need to become accountable of our own future and development.* Welcomed any organization’s training and development plans for us but do not rely on them. Make them consistent with our own interests or make sure we have our own plan.
- *Second, get digital.* It is not about using a smartphone, but it is a matter of thinking digital.
- *Third, learn how to learn* using every experience, never mind if it is positive or negative, to increase our capability to do more and different in the future.

6.2. Organizational Resistance

Experience shows that resistance to change is as usual as the need for the change itself. But there is not only the individual resistance. Blaming individuals is too simplistic.

I have been conducting an experiment for more than 20 years now.⁸ People from different countries, organizations, functions, ages and experiences. Groups of white and blue-collar workers. Including groups of board of directors.

During Lean and Six Sigma courses (by the way, with excellent qualifications from participants) I generated a disruption in the agenda. Suddenly, I stopped the subject under discussion and gave each group the same instructions: *“Please, count how many letters N there are in the paragraph.*

⁸ Raúl Molteni, “How social matters impact on results”, 2014.

You will see the instructions in the page I'll give you. It is a very simple task. Even though it is very simple, you have all the time you need".

I gave them a paragraph which has 46 words and 255 letters. Questions for you: do you expect errors in counting? If you do, you expect errors of different magnitude depending on the level of the group? Do you expect that the number of errors will depend on the organization's background?

Well, these are the results. Typical results. From all groups. No difference based on level, organization, specialty, country... Always a majority group of results between 16 and 22, with some few results between 0 and 3. Occasionally, higher numbers which could get up to 247. I had to understand why those results. I had been working or training these groups for hours. There was a very good relationship and understanding among all of us. Questions by the group were the usual practice. But when given the instructions, there were doubts but no questions were asked. Listening to the participants was enlightening; experiences they had had in the past made them react in a specific way. To understand the results: results from 17 to 21 represent the results of those who just counted the number of letters N within the named paragraph. Their mind told them: follow the instructions. Errors came from missing letters for not underlining them, or not writing the number line by line.

From 22 to 25 were the result from those who also counted within the named paragraph, but whose mind said: *"My experience tells me this is not so easy; just in case I am adding one more N to the result"*. From 9 to 16 were the results of those who also counted within the named paragraph, but their minds told them: *"follow the instructions, but this is not worth doing"*. 0 to 5 were the number counted by those whose mind said: *"this is a trap"*. So, they found a trap: *"Paragraph must be the next one or two sentences, that's it"* (part of the instructions).

But, as you can see, we also have higher numbers; 43 and up are the number of N letters counted by those whose mind said: *"this is a trap"*. So, they found a trap. A different trap. For example, numbers such as 43 or 55 came from those who considered the letter "U" as a small "N" turned upside down. And results such as 237, 240 or 241 were from those who counted the N letters from all the page. Only groups of students from the Henry Ford High School in Buenos Aires responded with a different pattern. They still had no work experience! So, if I wouldn't have known how many letters there were, what result should I have trusted?

Conclusion: something easy might lead to a not intended result. To a non-reliable result. No wonder, this shows that what people are used to seeing and living within an organization, triggers their behaviors. Even though a new task might be seen as very simple and logical, results might

be severely affected by their assimilated habits. Even though a transformation purpose might be seen logical and positive past experiences might tell people that they face another frustration.

Your organization might not have the same cultural bias as these hundreds of groups and thousands of people. But might have nonverbal instructions that *“bosses are always right so their voices should never be argued”*. Or that *“information is key so it can't be shared openly”*. Or that *“you must mind yourself, so teamwork is not something to strive for”*.

So, when a change is implemented, you should expect people to react as some learned pattern. That means variation, delays and not adoption of the change. No matter what it is, when you want innovation, transformation, more creative ideas, everyone to be agile, thinking in their customer, continuously improvement and teamwork, you need to understand how the culture is going to make people react. You might think it is not necessary. In the best-case scenario, you are going to get over-budget, be behind schedule, or the results will be lower than expected.

The immune system of the organization is much more powerful than the individual resistance. Policies, processes, the technological infrastructure, the metrics used, by who and how decisions are made, the compensation system, bosses' perception of *“I am the one who knows what decision to make”*, stakeholders demand, relationship with Unions and society and legal barriers impact more than people's unwillingness to change... In summary, the *“way things are done here”* creates much more resistance and much more impact. Experience shows that more than 60% of projects' objectives, budget and timing are not achieved due to social aspects of the project that were not seriously considered.

And here comes the most common mistake: thinking that only with communication and training, everything will work.

As Kris Østergaard states in *How Big Companies Can Simultaneously Run and Reinvent Their Businesses*:⁹ *“to create a strong innovation culture, an organization needs to thoroughly understand its immune systems. These are the mechanisms that protect the organization and operate around the clock to keep it healthy and stable, just as the body's immune system operates to keep the body healthy and stable. But in a rapidly changing world, many of these defense mechanisms are no longer appropriate and risk weakening organizations' innovation power.”*

⁹ Kris Østergaard, “How Big Companies Can Simultaneously Run and Reinvent Their Businesses”, Singularity Hub, 2019.

Therefore, organizations need to gain or improve some competencies:

- *Define* and put in place a *Purpose* with which employees can identify with. I am not talking about a well-defined political statement; I am talking about a real conviction of considering and responding to social needs as, for example, being aligned with one or more of the United Nations SGDs.¹⁰
- *Define* and install a *strategy* for the desired change that deals with the uncertainty.
- *Understand their employees*, their archetypes, their needs, where and why do they get joy and where and why they get pain along their employee experience.
- Understand and *improve the experience employees have and how aligned is it to the strategy*.
- *Empower* people of all levels and have them taking initiatives to respond to all stakeholders. And of course, how to better take advantage of all *data analytics techniques*.
- *Last, but not least, measure and track evolution*. Have a Scoreboard. As transformation requires a different mindset, what are the leading metrics to install that would indicate that the path used drives to a real and effective transformation? What set of metrics can cover how people transit the change stages, how sustainable the implementation of new habits and behavior is, and how quickly these metrics improve? And don't forget you are not doing this just to change culture only. So, technical metrics should be added to your scoreboard.

7. ACCOUNTABILITIES

Never talked about, but the organization's Board is *the* group accountable. They can really foster, help, approve and support, in a sustainable way, the constancy of purpose -as W. E. Deming put it in his 14 Points of Management¹¹ that a transformation require. But getting deeper in this concept will be subject of another paper.

Two functions have specific capabilities and tools to help organizations and their employees to transit transformations smoothly: HR and Quality.

¹⁰ United Nations, "17 Goals to Transform Our World", <https://www.un.org/sustainabledevelopment>.

¹¹ William Edwards Deming, "Out of the Crisis", Massachusetts Institute of Technology, 1982.

7.1. About HR

In South America most HR professionals are worried about improving HR systems as recruiting, assessment, promotion and training. Or to copy Google, Amazon, Mural or Mercado Libre. But the agility and flexibility needed to embark on a transformation journey might require another approach. In a recent McKinsey survey, 90% of HR managers admitted that the skills and capabilities they are hiring today would be out of time in the next 2 years.

HR is key for a transformation process to be successful. The human side of a change is usually underestimated, and this is the reason why results in more than 60% of projects are not achieved. Change management is key and well beyond training and communication. Never mind what the main focus of your change is, HR must be involved from the very beginning and during the design phase. If you don't get to know what habits and behaviors will be changed, and you don't have a clue on what reactions that change will provoke from the people, you will be late to address them.

So, HR is facing new demands and should acquire new capabilities, mental and physical to help with and become fully accountable to:

- *Comprehend the purpose the organization has* (Simon Sinek's *Why*.¹² And, how to understand the purpose employees pursue and how it aligns with the organization's own purpose.
- *Understand and measure the Organizational Health*¹³ and install specific tools and systems to improve it.
- *Get closer to every employee* to really understand their purpose, why they are working for the organization. And maybe find out that there are some of them with low performance but with the knowledge and capabilities to excel in the future.
- *Create an environment of comprehension*, were managers, supervisors and employees can openly understand each other and create together.
- Find all the *workforce archetypes, their journey, the moments of truth* and give segmented answers.
- *Manage the change*. Have a thoroughly designed strategy and plan that go far further from only training and communication.

¹² Simon Sinek, "Start with Why", Portfolio, 2009.

¹³ Aaron De Smet, Bill Schaninger and Matthew Smith, "The Organizational Health- and how to capture it". McKinsey, 2014.

- *Empower and sustain* a desired culture, sense of belonging and cohesion in a hybrid virtual and physical- way of working.
- Get the organization as a whole to acknowledge and *value society needs* such as sustainability.
- *Understand what talent means and would be needed in the future*, the difference with experience and knowledge and how and where to find it. And, how to improve Talent.
- *Find leading and lagging measures* that go beyond what is been done and allows understand what is been achieved.

7.2. About QUALITY

HR should provide methodology and tools to manage the human side of a change. But changes should end in having things done differently or in having different things done right. So, at some point people need to understand their stakeholders, design, experiment, produce, deliver, measure and learn in a solid and methodological way. Quality fundamentals, methodologies and tools can definitely help with this.

As W. Vandenbrande and N. Ramanathan stated,¹⁴ *“Quality management has a long history of being able to cut wastes and produce better designs faster and thus win customers, while simultaneously cutting costs. Quality comes with an array of management mechanisms such as Policy Management or Hoshin Kanri, which enable organizations to plan and execute their strategies through the combined efforts of its functions; cross-functional management that brings horizontal linkages in managing quality, cost and delivery; and daily management that helps maintain the gains and clarifies roles.”*

Quality professionals, as HR’s, have some capabilities to work on too. The International Academy for Quality Manifesto¹⁵ is a comprehensive document to visualize them. But there some of them that need to be detailed:

- *Understand that Stakeholder is the new Customer*. Every product, service or process should be designed, experimented, tested, produced, delivered and controlled not only from the customer and user perspective, but also from the employee, supplier and society perspective.

¹⁴ Naryanan Ramanathan, Willy Vandenbrande, “How Companies Can Apply Quality to Address Planet Earth Concerns”. Quality in Planet Earth Concerns Think Tank. International Academy for Quality, 2019.

¹⁵ Narayanan Ramanathan, Gregory H. Watson, et. al. “Quality Manifesto for the 21st Century”, International Academy for Quality, 2021.

- *Companies need facilitators.* People whose skills drive them to integrate visions and efforts from all functions. This goes well beyond teamwork. It means to create together effectively, not to interact effectively. Not only for a specific job or task, but for whatever they are working on. HR professionals should have this skill. Quality professionals too.
- *Emphasize the Juran's Big Q*¹⁶. Understand and go a step further than what is done today in order to promote and get others adhere and use the best practices of quality of management, not only to manage quality.

8. CONCLUSION

There is no such thing as an easy change when the culture is not prepared.

Sažetak:

TRANSFORMACIJA I DIGITALIZACIJA ZAHTIJEVAJU DUBOKO RAZUMIJEVANJE KVALITETE I KULTURE

Transformacija i svi slični nazivi koje koristimo da bismo odgovorili na to kako bi organizacije trebale pristupiti evoluciji s kojom se suočavamo nije samo tehnologija. To svi znamo. Ali sve vrste procjena pokazuju isto: posljedice transformacija gotovo su uvijek na kulturnoj razini. Glavni razlog nije taj što ljudi nemaju sposobnosti razumijevanja i dosljedne implementacije. Možda se ne bavimo dovoljno potrebnim organizacijskim sposobnostima. Ova se rad bavi organizacijskim i individualnim sposobnostima potrebnim za uspješnu transformaciju u jednostavnim organizacijama. I ulogom ljudskih potencijala i kvalitete.

Ključne riječi: kvaliteta, transformacija, digitalizacija, kultura kvalitete.

¹⁶ Naryanan Ramanathan, Willy Vandenbrande, "How Companies Can Apply Quality to Address Planet Earth Concerns". Quality in Planet Earth Concerns Think Tank. International Academy for Quality, 2019.

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COMPETENCES DEFICIT – REQUIREMENTS OF INDUSTRY 4.0

DEFICIT KOMPETENCIJA – ZAHTJEVI INDUSTRIJE 4.0

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ABSTRACT

Automation and robotization of manufacturing processes is becoming popular in the economy of developed countries, which means the liquidation of some (estimated 45%) professions by 2030. Changes in market conditions lead to changes in the competences requirements of employees. The article presents the results of a pilot study aimed at identifying the competences deficit in terms of industry 4.0 requirements.

Key words: Industry 4.0, digital competences

1. INTRODUCTION

The fourth industrial revolution is the idea of digital transformation, based on the use of modern technologies in production. It is shifting the industry towards intelligent and flexible production, which allows companies to adapt to the dynamically changing needs of customers.^{1,2,3} At the same time, adaptation in the face of rapid changes, forced by the rapid pace of technology development, is the main challenge facing enterprises that want to maintain their position and strengthen their competitive advantage. Employers as well as the education system asks the following questions:

- What skills and qualifications of students/staff should now be developed?
- Based on what models of education should the educational processes be implemented?
- What changes are needed in the education system in the light of Industry 4.0?

The data published in the ARP report (Agencja Rozwoju Przemysłu S.A.) from 2020 show very clearly the changes that are taking place and will take place in the perspective of 2030:⁴

- 9 out of 10 contemporary professions require basic digital competences,
- 58% of EU citizens and 44% of Poland have at least basic digital competences,
- 85% number of internet users in the EU, 9% have never used the internet, in Poland 78% and 15% respectively,
- the number of people employed in IT professions in Europe will increase by 13%, and in Poland by 30%
- 1.7 million jobs will increase for ICT specialists in EU countries by 2030,
- 3.5 million employees - this is the global shortage of specialists in the field of cybersecurity,

¹ Vasavi Dadi, Nikhil Ram, Rahul S Mor, Tripti Agarwal, Arora Sapna, "Agri-Food 4.0 and Innovations: Revamping the Supply Chain Operations", *Production Engineering Archives*, 27(2), 2021, pp. 75-89.

² Mohammad Haseeb, Hafetaku Igbal Hussain, Beata Ślusarczyk, Kittisak Jermsittiparsert, "Industry 4.0: A solution towards technology challenges of sustainable business performance", *Social Sciences*, 8(5), 2019, p. 154

³ Beata Ślusarczyk, "Industry 4.0 – Are we ready?", *Polish Journal of Management Studies*, 17(1), 2018, pp. 232-248.

⁴ Kompetencje 4.0 – raport Agencji Rozwoju Przemysłu, S.A. Warszawa, 2020.

- 57% of companies in the EU that wanted to hire ICT specialists had problems filling the vacancies,
- 12% of managers in the EU have taken any action to address the digital competency gap,
- 47% of workers in the EU believe that their current skills will become obsolete in the next 5 years,
- 9-45% of current jobs will be partially or fully automated by 2030.

2. COMPETENCES OF EMPLOYEES 4.0

Industry and business have their own list of necessary competences, and education has its own list. The challenge is to bring both areas closer in such a way that the education system realistically responds to the competency needs of industry 4.0. Reducing the difference between expectations and the delivery of real digital competences by the education system is possible, provided that four groups of competences are focused on: digital and technical, social, cognitive and leadership.

The skill sets in the first set will differ depending on whether the individual will function in industry, administration, or services. In the second, the key is the ability to communicate in project teams, often international, composed of people from various disciplines. These competences are key when it comes to dealing with change, building openness in the face of uncertainty. In this area, emotional intelligence is particularly important, as it is responsible for successful cooperation with others, as well as for the manner of expressing emotions.

Cognitive competences, in turn, are expressed in the ability to use knowledge from various fields, and everyone should have leadership skills, even if they manage small projects.^{5,6}

In the new technological environment, changes in competences the portfolio of employees will largely relate to competences related to interpersonal interactions and advanced cognitive skills.⁷ Of great importance will be

⁵ Sirorad Pattanapairoj, Krisanarach Nitisiri, Kanchana Sethanan. "A Gap Study between Employers' Expectations in Thailand and Current Competence of Master's Degree Students in Industrial Engineering under Industry 4.0," *Production Engineering Archives* 27(1), 2021, pp. 50-57.

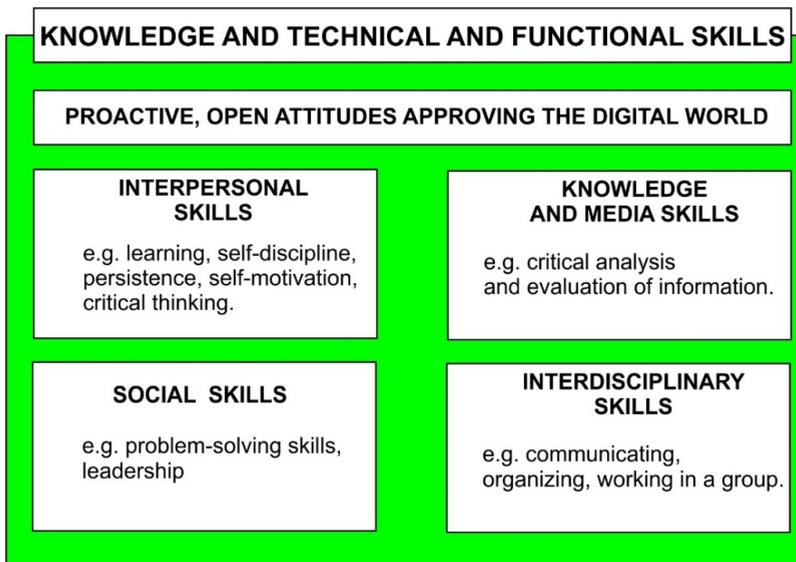
⁶ Rubén Ávila Rodríguez, C.M.A. Avila, "Digital competences in university students and teachers in the area of Physical Education and Sports," *Retos* (43), 2022, pp. 1065-1072.

⁷ Paul Baudry, David A. Green, Benjamin M. Sand, "The Great Reversal in the Demand for Skill and Cognitive Tasks", NBER Working, 18901, 2013.

non-routine social and emotional skills, creativity and other abilities, the use of which at work is difficult to automate.^{8,9} They will enter the canon of competences of the digital age. At the same time, however, having basic technical digital skills will become the responsibility of every employee, regardless of their profession. The ARP report (digital competences) proposes the concept of competences 4.0, which is presented in Figure 1. It is a broad approach to the competences of the digital age, which is practically related to the development of Industry 4.0, where creativity, effectiveness and employee efficiency will play an important role.¹⁰

All components of competences, i.e. both knowledge and efficiency in performing activities, can be shaped. You can also influence attitudes. Much depends on the profile of automation and digitization of the work or learning environment.

Figure 1. The concept of digital competences 4.0



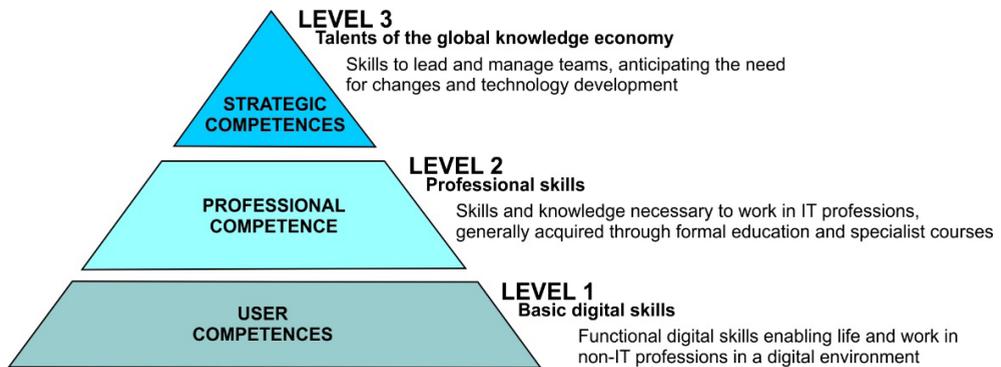
⁸ McKinsey & Company, Jobs Lost, Jobs Gained, Workforce Transitions in a Time of Automation, McKinsey Global Institute, 2017.

⁹ Tadej Derenda, Marina Zanne, Mate Zoldy, Adaam Torok, “Automatization in road transport: a review,” *Production Engineering Archives* 20, 2018, pp. 3-7.

¹⁰ Bertrand Pedersen, Laurent Probst, Jill Wenger, *Skills for smart industrial specialisation and digital transformation: final report*, European Commission, Executive Agency for Small and Medium-sized Enterprises, Publications Office, 2019.

Where people will primarily perform unique, creative activities, pro-social attitudes focused on people and cooperation are of key importance. It is very important to know the procedures, i.e. how to use digital tools in such a way as to maximize the opportunities they create. It is also necessary to train skills related to the use of the features of the digital environment – distance collaboration, decentralization, huge data flow, high speed of operation, limited interpersonal contacts. The paper¹¹ presents a pyramid of digital competences, in which we distinguish three levels of competences Fig.2.

Figure 2. The digital competence pyramid

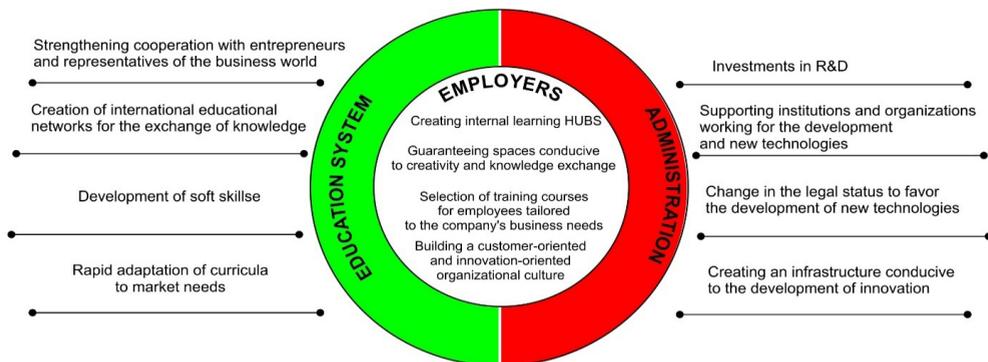


New professions will require employees to acquire competences 4.0. The competences deficit 4.0 will increasingly become a barrier to economic development. Some professions will disappear, for example related to administration or accounting, because activities in these areas can be easily automated. Already in 2023, the estimated time of work performed by intelligent and automated systems will amount to nearly 42%.¹²

¹¹ Desirée van Welsum, Bruno Lanvin, *e-Leadership Skills. Vision Report*, ISEAD, 2012.

¹² Bertrand Pedersen, Laurent Probst, Jill Wenger, *Skills for smart industrial specialisation and digital transformation: final report*, European Commission, Executive Agency for Small and Medium-sized Enterprises, Publications Office, 2019.

Figure 3. System of connections for the development of digital competences



How is the education system able to meet the new requirements in terms of education and the acquisition by students of the competences and skills required under the new conditions? Without cooperation with the business environment as well as with the administration, the education system will not be able to cope with the rapidly changing conditions as well as the changing demand for 4.0 competences. Figure 3 shows a system of mutual relations from which it is clear that further development of key competences will only be possible with the cooperation of business, administration and the education system.

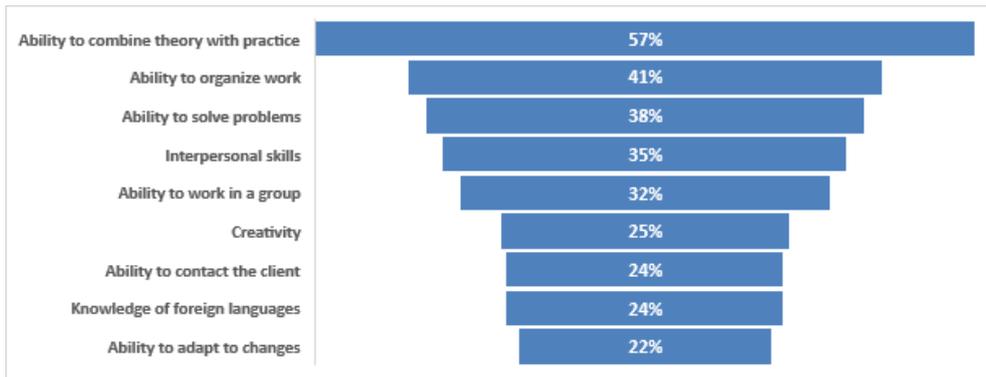
3. IDENTIFICATION OF DEFICIT SKILLS AND COMPETENCES

In the opinion of employers, the identification of deficit skills and competences was carried out on the basis of the results of an in-depth interview carried out on a group of representatives of 30 production and service enterprises from the SME sector. The research was conducted in the second half of 2021. 9 key deficit skills have been defined. A summary of the obtained results is presented in Figure 4. In the employers' opinion, the greatest deficit of skills and competences occurs in the area of practical use of knowledge in the technical area. Employers point out a large lack of competences in the field of systems integration, mathematical modeling and simulation as well as competences in the field of quality management, risk assessment and safety.

The second deficit area is the ability to organize work and time management. There is a large competency gap in communication and interpersonal skills, in particular in verbal and written communication, public communication and online collaboration. Another area is innovation – that is, the ability to

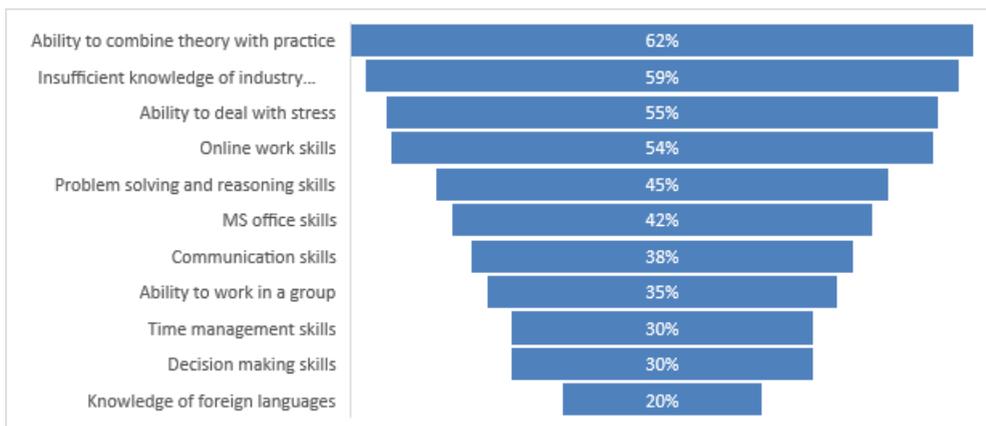
solve complex problems. Employers also point to the problem of reducing employees' resistance to stress related to changes or the ability to cope with their own emotions or other people's emotions. A big problem reported by employers is the lack of self-control, the lack of decision-making and responsibility.

Figure 4. Deficit skills and competences in the opinion of employers



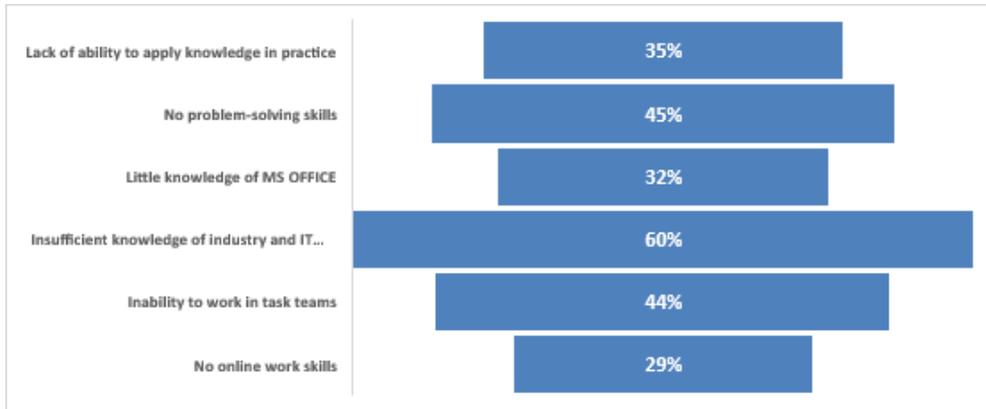
A similar study was conducted among students of the last semester of engineering studies. During the interview, the students themselves defined the areas of deficit skills and competences. Then they indicated in which areas they have the greatest deficit of skills. Figure 5 presents a summary of the obtained results.

Figure 5. Deficit of skills and competences in the opinion of students



Academic teachers were asked to indicate the deficit of students' competences in terms of the requirements of industry 4.0.

Figure 6. Deficit of skills and competences in the opinion of students



Teachers from two technical universities were invited to participate in the research.

4. DISCUSSION

Changes in economic conditions - technological, legal, business, social, the COVID -19 pandemic will inevitably bring the era of Industry 4.0.^{13,14,15} Competences of the digital age will play a key role in this process. These competences include not only the traditionally understood technical skills, but also – equally important – the so-called soft competences, including transversal competences (social, communication, media and interpersonal). The new labor market of Industry 4.0 presents not only employees (engineers

¹³ Natalia Baryshnikova, Olga Kiriliuk, Dorota Klimecka-Tatar, „Enterprises' strategies transformation in the real sector of the economy in the context of the COVID-19 pandemic”, *Production Engineering Archives*, 27(1), 2021, pp. 8-15.

¹⁴ Joanna Prasalska-Nikoniuk, Karolina Stegienko, Robert Ulewicz, „Managing the process of supervision over the certificate during a pandemic – remote inspections”, *Polish Journal of Management Studies*, 2021,

¹⁵ Margarita Núñez-Canal, M. de las Mercedes, de Obesso, Carlos Alberto Pérez-Rivero, “New challenges in higher education: A study of the digital competence of educators in Covid times”, *Technological Forecasting and Social Change* 2022, p. 174.

and technicians) but also teachers with new quality challenges in terms of acquiring knowledge and skills, but also adapting attitudes to changing production conditions.

The presented research results are of a pilot nature and indicate a deficit of competences defined by individual groups of stakeholders. There are certain similarities, but also in the perception of the competences and skills required. All groups indicated a significant deficit of skills in the field of practical application of knowledge (employers 57%, students 63% and academics 35%). Employers also indicate a problem with competences related to the organization of work. 41% students indicated 30% of teachers did not indicate a deficit in this area. Problem solving is another area with a large similarity of the competency deficit according to all stakeholders of the employer (38%, students 45% and academics 45%). At the same time, solving problems is defined in a completely different way by individual stakeholders from the ability to create new solutions, system thinking and creativity through the mundane transfer of files between computers, installing software and applications or changing the settings of computer programs and operating systems and ensuring their security. There is a difference in the perception of the soft skills deficit in the field of communication, the so-called emotional intelligence and resistance to stress. In the case of academic teachers, the deficit in this area of competences was not diagnosed, however, both in the case of employers and students, a significant deficit of these competences was demonstrated.

In the future, proactive attitudes resulting from the possession of transversal competences will be the key to the development of enterprises. The place of acquiring new competences and raising their level to a much greater extent than before must be enterprises with their own educational policy, which should become an element of their value chain. In the future, universities will have to change the teaching model and react much faster to the new demand for employee competences. It also has to cooperate to a much greater extent with the economic environment and introduce didactic solutions based on problem learning.

5. SUMMARY

Working in the conditions of dynamic development of emerging technologies will require appropriately adapted competences, going beyond the digital technical competences that have so far been considered essential. Already today we meet with a great demand for e-leaders – capable of creating

and implementing innovations. The existing deficits of digital competences may become a factor of high risk of limiting competitiveness and development abilities. The most important reasons for this are the nature of production and services. We also deal with the lack of digital competences at universities in the field of data security or remote work. Poland is one of the countries affected by the crisis of digital competences necessary for the country's development.

Sažetak:

DEFICIT KOMPETENCIJA – ZAHTJEVI INDUSTRIJE 4.0

Automatizacija i robotizacija proizvodnih procesa postaje sve popularnija u gospodarstvu razvijenih zemalja, što znači likvidaciju nekih (procijenjenih 45%) profesija do 2030. godine. Promjene u tržišnim uvjetima dovode do promjena u zahtjevima kompetencija zaposlenika. U članku su prikazani rezultati pilot studije čiji je cilj bio identificirati deficit kompetencija u smislu zahtjeva industrije 4.0.

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Ključne riječi: Industrija 4.0, digitalne kompetencije.

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ODABIR KVALITETNIH KADROVA ZA POSLOVE U IT SEKTORU

SELECTION OF QUALITY STAFF FOR JOBS IN THE IT SECTOR

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SAŽETAK

U današnjem suvremenom i globaliziranom svijetu uspjeh poslovnih organizacija uvelike ovisi o kvaliteti zaposlenika organizacije. Zaposlenici predvođeni menadžerima odgovorni su za uspjeh organizacije u ostvarenju organizacijskih ciljeva. Postavlja se pitanje što definira kvalitetnog zaposlenika, kako organizacija pronalazi takve zaposlenike te kako organizacija potiče i sudjeluje u njihovu razvoju i podizanju kvalitete rada? Djelatnost koja bilježi strelovit razvoj te porast poslovanja je područje informatičke tehnologije (IT). IT djelatnost bilježi razvoj i porast broja zaposlenih i u Hercegovачko-neretvanskoj županiji (HNŽ) koja se nalazi u BiH. U ovom radu prezentiraju se rezultati istraživanja provedenih na nekoliko poduzeća koja se bave informacijskim tehnologijama u HNŽ-u. Istraživanje se temelji na pitanjima koja daju odgovore upravo o kvaliteti zaposlenika, prepoznavanju takvih zaposlenika, kvaliteti njihova rada te razvoju i podizanju kvalitete zaposlenika. Pored navedenih pitanja o kvaliteti zaposlenika istražiti će se doprinos takvih kadrova na organizacijsku uspješnost.

Ključne riječi: kvaliteta, djelatnost informacijskih tehnologija, kvaliteta zaposlenika, kvaliteta rada.

1. UVOD

U današnje vrijeme svjedoci smo naglog razvoja tehnologije i njezine sve veće primjene u svakodnevnom životu. Sukladno rastu i razvoju tehnologije vidljiva je ekspanzija i rast poduzeća vezanih za IT industriju. Neke od najbogatijih korporacija na svijetu bave se uglavnom poslovima vezanim za informacijske tehnologije, kao npr. Apple, Google, Microsoft i brojni drugi. Ekspanzija i razvoj poduzeća koja se u užem području bave IT-om vidljiv je i na području HNŽ u Bosni i Hercegovini. Neka od tih poduzeća nalaze se u prvih 100 po dobiti na službenoj listi Financijsko informatičke agencije¹ u FBiH (FIA) za 2019. i 2020. godinu. Razlog svakako leži u tome što smo u svakodnevnom životu i poslovanju sve više vezani za tehnologiju i njezine proizvode, pa stoga ne čudi da velika većina visokoobrazovnih ustanova pokreće razne studije informatičko tehnološke prirode. Budući da je IT zanimanje budućnosti postavlja se pitanje šta podrazumijeva kvalitetan IT kadar, kako ga privući, obučiti i zadržati. Ovaj rad sadrži odgovore nekoliko vodećih poduzeća iz područja IT-a, a vezana su za kvalitetu kadrova koji rade za njih. Kvalitetan kadar koji razumije takvu vrstu posla postaje jedan od najvažnijih resursa svakog poduzeća koji se bavi ili se namjerava baviti informacijskim tehnologijama.

2. DEFINIRANJE KVALITETE

Bitan uvjet uspješnosti poslovanja i razvoja određene gospodarske djelatnosti, odnosno poduzeća određen je kvalitetom i kombinacijom elemenata razvoja. Opređeljujuća determinanta razvoja polazi od stručnih kadrova kao osnovnog činitelja razvoja informacijsko tehnoloških organizacija. „Kvaliteta je svojstvo proizvoda ili usluge da pouzdano čini ono za što je osmišljena. Također, to je stupanj do kojeg proizvodi i usluge zadovoljavaju potrebe i zahtjeve klijenata, što je često teško precizno odrediti jer ovisi o percepcijama klijenata o tome koliko proizvod/usluga zadovoljava ili premašuje njihova očekivanja.“² Prema *Ekonomskom leksikonu* „kvaliteta je ukupnost obilježja i svojstava proizvoda ili usluge koja određuje njihove mogućnosti ili njihovu

¹ Financijsko informatičke agencija, URL:<https://bhas.gov.ba/>, (pristup: 13.12.2021.).

² O. C. Ferrell, Geoffrey A. Hirt, *Business-A Changing World*, Boston, Irwin-Mc-Graw-Hill, 2000., str. 233

upotrebu.³ Najbolji pokazatelji da tržište nema milosti i da na tržištu opstaju samo oni koji najbrže odgovaraju promjenama u okolini je prošla svjetska ekonomska kriza. Milojević i Veselinović⁴ navode da su na početku 2009. godine mnogi velikani automobilske industrije bilježili drastičan pad prodaje i tražili su pomoć svojih matičnih država, kako ne bi bankrotirali i povukli cijela gospodarstva u propast, u isto vrijeme Hyundai je zabilježio rast prodaje 50% preko planirane. Razlog za to je što su imali dobro obučene kadrove koji su shvatili problem i ponudili adekvatno rješenje. Kvaliteta organiziranja, kvaliteta rada i kvaliteta proizvoda javljaju se kao ključni elementi uspješnosti u poslovanju i razvoju poduzeća. Ključnu ulogu u tome imaju kadrovi, tako da je kvaliteta kadrova ključni element koji povezuje navedene elemente poduzeća zaduženih za razvoj. „Kvaliteta se smatra važnom za suvremene organizacije zbog tri konkretna razloga: konkurencije, produktivnosti i troškova.“⁵ Za održavanje kvalitete jedan od ključnih zadataka je nagrađivanje kvalitete (koristiti poticaje ili sankcije) te provoditi treninge kvalitete za sve organizacijske jedinice. Navedeni zadaci odnose se na kadrove i njihovo podizanje kvalitete. Postizanju navedenog može pomoći i promicanje sudjelovanja za sve kadrove te poticanje inovacije i kontinuirano unapređivanje. Kvaliteta ponajprije polazi od vrhovnog menadžmenta. „Osim strategijskog opredijeljena vrhovnog menadžmenta, kako bi filozofija upravljanja potpunom kvalitetom u nekoj organizaciji zaživjela, potrebno je u nju uključiti zaposlenike i to ne samo u njezino provođenje već i u kreiranje. Posebice je pri tome važna uloga timskog rada.“⁶ Analizirajući dosad navedenu literaturu, jasno je da ista upućuje na značaj kvalitete kao elementu za uspješno poslovanje i ostvarenje temeljnih organizacijskih ciljeva.

2.1. Kvalitetni kadrovi

U stvaranju kvaliteta dominirajuću ulogu imaju kadrovi. Oni su:

- inicijatori svih promjena u poduzeću,
- kreatori sustava kvalitete,
- upravljači tim sustavom,

³ Leksikografski zavod Miroslav Krleža, *Ekonomski leksikon*, Zagreb, Masmedia, Leksikografski zavod Miroslav Krleža, 2011., str. 435.

⁴ Usp., Ankica Milojević, Saša Veselinović, „Upravljanje totalnim kvalitetom i kadrovi“, *Tehnička dijagnostika*, Vol. 1, 2009, str. 40.

⁵ Trevis S. Certo, Samuel S. Certo, *Moderni menadžment*, deseto izdanje, Zagreb, Mate d.o.o., 2008., str. 503.

⁶ Pere Sikavica, Fikreta Bahtijarević-Šiber, Nina Pološki Vokić, *Temelji menadžmenta*, Zagreb, Školska knjiga, 2008, str. 824.

- kreatori organizacijske strukture i organizacijskih postupaka,
- neposredni organizatori procesa rada,
- akteri u odvijanju procesa rada,
- kontrolori odvijanja procesa rada i kontrolori kvaliteta proizvoda i usluga,
- nosioci zadatka plasiranja na tržištu određenog proizvoda ili usluge, i dr.⁷

Za obavljanje svih tih aktivnosti njima su potrebna određena znanja, vještine i sposobnosti, kao skup karakteristika kojima se izražava radni potencijal svakog pojedinca. Upotreba tog potencijala zavisi od niza organizacijskih, ekonomskih, socijalnih, psiholoških i drugih činitelja. Pri tome je posebno značajna uloga motivacije kao psihološkog činitelja, koja često predstavlja pokretačku snagu za stvaralačke i druge aktivnosti pojedinca u procesu rada, kao i njegovu pripremu za obavljanje složenijih i odgovornijih poslova prvenstveno putem uključivanja u različite oblike obrazovanja. Sikavica, Bahtijarević-Šiber i Pološki Vokić u svom djelu *Suvremeni menadžment* navode „da tehnološki napredak, unatoč sve novijim tehnologijama koje okolinu u kojoj djeluju suvremene organizacije čine neizvjesnom, uvelike pridonosi efikasnosti i efektivnosti rada pojedinaca, menadžera i cijele organizacije. U svom djelu naglašavaju efikasnost i efektivnost pojedinca.“⁸ Takav pojedinac podrazumijeva kvalitetan kadar jer svojom efektivnosti stvara razliku za svoje poduzeće. Značaj i sadržaj uloge kadrova u stvaranju kvaliteta definira i njihov ukupan tretman u upravljanju razvojem i poslovanjem poduzeća. Iz tog razloga u okviru sustava kvaliteta posebna pažnja se poklanja kadrovima i kadrovskim procesima koji su u funkciji optimizacije kadrovske strukture i ostvarivanja maksimalnog radnog angažiranja zaposlenih u poduzeću. Da bi ostvarili uloge koje su determinirane organizacijskim propisima poduzeća, kadrovi trebaju imati odgovarajuću stručnu spremu za rad na radnom mjestu. Svi elementi optimalnog profila definiraju se u okviru sistematizacije radnih mjesta, dok se osiguranje izvršilaca s potrebnim i poželjnim karakteristikama ostvaruje obavljanjem više kadrovskih procesa: pribavljanjem novih kadrova, njihovim uvođenjem u proces rada, obrazovanjem, pokretljivošću i motiviranjem kadrova za rad i razvoj. Dakle, sustav kvaliteta se ne može osigurati bez jasne diferencijacije funkcija organizacije i upravljanja kadrovima.

⁷ Usp. Ankica Milojević, Saša Veselinović, „Upravljanje totalnim kvalitetom i kadrovi“, Tehnička dijagnostika, Vol. 1, 2009, str. 40..

⁸ Pere Sikavica, Fikreta Bahtijarević-Šiber, Nina Pološki Vokić, *nav. dj.* str. 317.

3. KVALITETA KADROVA U IT PODUZEĆIMA

Kratica IT označava informacijske tehnologije, odnosno engl. information technology. „Informacijska tehnologija (IT) predstavlja spregu mikroelektronike, računala, telekomunikacija i softvera koja omogućuje unos, obradu i distribuciju informacija.“⁹ Prema *Leksikonu menadžmenta* „IT predstavlja termin koji uključuje sve tehnologije čiji je zadatak kreiranje, pohranjivanje, obrada i razmjena informacija u svim oblicima.“¹⁰ U poslovnom okruženju osnovni resurs svakog poduzeća čine ljudi i njihove sposobnosti, koji doprinose ostvarenju organizacijskih ciljeva. Suvremena poduzeća mogu da očekuju uspjeh u razvoju, bolju produktivnost, profitabilnost i uspješnost na tržištu, ukoliko im je na prvom mjestu regrutacija stručnih i kvalitetnih kadrova na izvršnim funkcijama. Ljudski resursi su osnovni činitelj poslovanja, njihovo planiranje mora biti dio opće strategije rasta poduzeća. „Snaga svakog poduzeća se ogleda u kvalitetnoj kadrovskoj strukturi.“¹¹ Kvalitetna kadrovska struktura se može smatrati značajnom konkurentskom prednošću poduzeća. Plansko uvođenje novih kadrova u poslovanje poduzeća omogućuje bržu i lakšu socijalnu, radnu i psihološku adaptaciju u organizacijsku sredinu. Na taj način novoprimiteljni ljudski resursi formiraju dobre radne navike, brže se osposobljavaju za poslove za koje su primljeni i u kraćem vremenskom periodu mogu pružiti maksimum kompaniji koja ih zapošljava. Jasnom podjelom rada u IT sektoru lakše se uvode novi kadrovi u poslovanje, neophodne obuke se sprovode ciljano i planski čime se pruža kvalitetnija usluga krajnjim korisnicima. Obuka IT kadrova zavisi prvenstveno od potreba i skupa tehnologija koje su neophodne za obavljanje posla u organizaciji ili u određenom profilu poduzeća. Prostor za daljnje obrazovanje je jako širok i može se kretati u pravcu specijalizacije IT stručnjaka za sigurnost, enkripciju podataka, mreže i razne vrste integracija, kao i za određene operativne sisteme, aplikacije, servise, rešenja i serverske tehnologije.¹² Upravljanje kvalitetom uvelike ovisi o samoj organizaciji, menadžerima i pojedincima. Kod organizacija jako je bitno da ista njeguje organizacijsku kulturu koja potiče upravljanje kvalitetom. Pored navedenog, bitno je treniranje i ovlašćivanja timova zaposlenika na samostalnost u donošenju odluka koje organizaciji omogućuju veće razine

⁹ Vlatko Čerić, Mladen Varga, *Informacijska tehnologija u poslovanju*, Zagreb, Element, 2004, str. 24.

¹⁰ Fikreta Bahtijarević-Šiber, Pere Sikavica, *Leksikon menadžmenta*, Zagreb, Masmedia, 2001, str. 171.

¹¹ Živorad Vasić, Milica Jevremović, Julijana Pantić, „Značaj uvođenja novih kadrova u organizaciju sa osvrtom na IT sektor“, *Infoteh-Jahorina*, Vol. 13., 2014, str. 1016.

¹² Usp., ATC, URL:Napredovanje i edukacija - ATC, (pristup: 6.1.2022.)

performansi. Menadžeri u svom djelovanju trebaju održavati treninge, informirati i davati potporu zaposlenicima kako bi isti zadovoljivi standarde kvalitete. U svom djelovanju trebaju upozoriti na probleme vezane uz kvalitetu. Sikavica, Bahtijarević-Šiber i Pološki Vokić navode da „pojedinci u svom radu trebaju biti posvećeni kontroli potpune kvalitete i usredotočeni na prevenciju, a ne na detekciju.“¹³ U današnje vrijeme, vrijeme munjevitog razvoja informacijskih tehnologija jako je teško pronaći kvalitetni kadar, a pogotovo zadržavanje postojećeg kvalitetnog kadra. Razlog tome leži i u činjenici da je gospodarski i tehnološki procvat otvorio višestruke mogućnosti za zapošljavanje. Također, postaje sve skuplje zamijeniti kvalitetnog stručnjaka koji su otišli iz tvrtke. „Neke procjene pokazuju da je trošak zamjene informacijskog stručnjaka bio 1 do 2,5 puta viši od njihove godišnje plaće.“¹⁴ Može se zaključiti kako je ključno za poduzeća iz područja IT-a pronaći potencijalne kvalitetne kadrove te ih obučavati i razvijati do njihova punog potencijala. Nakon razvoja takvog kadra, najbolji potez poduzeća je zadržavanje takvih kvalitetnih kadrova jer nesumnjivo kao takvi stvaraju razliku u poslovanju, konkurentsku prednost i bolje zadovoljnije kupce i korisnike usluga. Također, može se reći da kadar u IT predstavlja jedan od inputa poduzeća za dobivanje konačnog proizvoda ili usluge.

4. REZULTATI I ANALIZA ISTRAŽIVANJA

Analizom dostupne literature kreiran je set pitanja koja mogu poslužiti u identifikaciji kvalitete zaposlenika, te koja su njegova osnovna obilježja. Pored navedenog kroz odgovore, doći će se i do spoznaja o kvaliteti zaposlenika s kojima raspolažu IT tvrtke sa prostora HNŽ-a. Odgovori na postavljena pitanja pomoći će odgovoriti kako i na koji način IT tvrtke pronalaze kvalitetne zaposlenike i da li ih tvrtka potiče u razvoju i na koji način. Kao najvažniji zaključak iz seta ponuđenih odgovora zasigurno se odnosi na tvrdnje o tome *Koliko* kvaliteta zaposlenika doprinosi uspješnosti tvrtke. Podaci o demografskim obilježjima odnose se na spol, dob duljina radnog staža i funkciju koju ispitanik obnaša kod trenutnog poslodavca. Demografski profil ispitanika po spolu pokazuje da postoji značajan broj muških ispitanika kojih je bilo 78,9% u odnosu na 21,8% ženskih ispitanika. Preko 50% ispitanika ima između 11 i 20 godina radnog staža, a njih preko 65% nalazi se u dobnoj skupini između 35 i 48 godina. Na upit o obliku tvrtke u kojoj su uposleni njih 68% je odgo-

¹³ Pere Sikavica, Fikreta Bahtijarević-Šiber, Nina Pološki Vokić, *nav. dj.*, str. 825.

¹⁴ Clinton O. Longenecker, Jozeph A. Scazero, „The turnover and Retention of IT Manager sin Rapidly Changing Organizations“, *Information System Management*, 2003, p. 58.

vorilo da se radi o obliku društva sa ograničenom odgovornošću. Ispitanici rade u poduzećima koja se bave samo osnovnom djelatnošću, njih 36,8%, osnovnom i dodatnom djelatnošću 21,1%, te više ravnopravnih i nepovezanih djelatnosti 42,1%. Poduzeća koja su sudjelovala u istraživanju ima manje od 9 uposlenih i takvih je 10%, broj zaposlenih se kreće između 10 i 49 ima njih 47%, a u poduzećima u kojima je uposleno između 50 i 249 ima 21%; 250 i više, također je 21%.

Od svih ispitanika koji su sudjelovali u istraživanju najviše je direktora/generalnih direktora 21%, članova uprave ili izvršnih direktora 15 %, savjetnika uprave 5%, voditelja službe/ureda za IT 26% od čega je samo 5% ženskih ispitanika. Među rukovodećim osobama u poduzećima nema ženske populacije. Dok je najveći broj žena na pozicijama rukovoditelja kadrovske odjeljenja 7 i među voditeljima službe za odnose s javnošću, marketinga 80%. Regrutiranje novih kadrova u poduzeću vrši se putem eksternog oglašavanja (dnevne novine, portali, billboardi i sl.) oko 47% ispitanih poduzeća upošljava nove kadrove na ovaj način. Od kombiniranih odgovora najveći udio je onih koji koriste mogućnosti eksternog oglašavanja i posredovanje agencije za zapošljavanje, njih oko 35%. Tek 5% ispitanika koristi preporuke bliskih suradnika, poslovnih partnera i sl., dok je 8% koji koriste zavod za nezaposlene i 5% koristi obrazovne institucije. Za odabir kadrova za zapošljavanje tvrtke i to njih 68% koristi testove, CV-a i intervju za zapošljavanje novih kadrova. Preko 50% ispitanika smatra kako je kod odabranog kadra za zaposlenje do značajne kvalitete rada došlo nakon 6-12 mjeseci rada, dok njih 21% smatra da do značajne kvalitete rada dolazi nakon 12-24 mjeseca. Podizanje kvalitete kadrova u poduzeću vrši se na temelju dodatnog rada/angažmana na više projekata smatra preko 26% ispitanika, dok njih 10% misli kako je za podizanje kvalitete kadrova u poduzeću moguće dodatnog rada/angažmana na više projekata, teambuildingom i dodatnim obrazovanjem/obukama i sl. Sve ostale kategorije poput, raznih stimulacija kroz nagrađivanje, kontinuiranim unapređenjem i ostvarivanje bonusa na temelju učinka uzima za bitno oko 5% ispitanika kao samostalne kategorije ili individualne. Većina ispitanika tvrdi kako je povećanje plaće za obavljeni rad osnova za zadržavanje kvalitetnih kadrova i to čak njih 85%, dok je njih 15% utvrdilo kako se kvalitetan kadar može zadržati uz povećanje plaće i nagrađivanje kroz priznanje, darove sl.

Prema mišljenju *ispitanika na kvalitetu pojedinca kao zaposlenika* najznačajniji utjecaj kad su u pitanju pojedinačni odgovori jeste *Obrazovanje*, što misli preko 65% svih ispitanika, dok je za *uspješnog pojedinca kao zaposlenika odgoj, obrazovanje i interno okruženje poduzeća* što smatra preko 38% ispitanika.

Tablica 1. Doprinos kvalitetnih kadrova u sljedećim aktivnostima vašeg poduzeća (%)

	Uopće ne doprinosi	Uglavnom ne doprinosi	Niti doprinosi niti ne doprinosi	Uglavnom doprinosi	U potpunosti doprinosi
Istraživanje i segmentiranje ključne/ciljane okoline poduzeća	5,3	5,3	15,8	57,9	15,8
Usklađivanje strategije poduzeća sa interesima ključnih javnosti	5,3	5,3	5,3	63,2	21,1
Savjetovanje donositelja odluka u području IT-a	0	5,3	10,5	57,9	26,3
Program razvoja proizvoda ili usluga	0	0	15,8	36,8	47,4

Izvor: Izradili autori.

Kvaliteta kadrova uglavnom doprinosi u istraživanju i segmentiranju ključne/ciljane okoline poduzeća smatra 57,9% ispitanika. Ukupno 15% ispitanika koji se u potpunosti slaže s navedenom tvrdnjom. Kvaliteta kadrova doprinosi usklađivanju strategije poduzeća sa interesima ključnih javnosti (63,2%), savjetovanju donositelja odluka u području IT-a 57,9%, te programu razvoja proizvoda ili usluga.

Tablica 2. Doprinos kvalitetnih kadrova poslovnom uspjehu poduzeća (%)

Doprinos kvalitetnih kadrova poslovnom uspjehu poduzeća		
U potpunosti doprinose	7	36,8
Uglavnom doprinose	12	63,2

Izvor: Izradili autori.

Svi ispitanici smatraju kako kvaliteta kadrova *doprinosi poslovnom uspjehu poduzeća*, od čega 36,8 smatra da u potpunosti doprinose i to njih 36,8% i da uglavnom doprinose smatra 63,2%.

5. ZAKLJUČAK

Konkurentska pozicija poduzeća ovisi u dobroj mjeri od kvalitetne kadrovske strukture. Uvođenje novih u poslovanje poduzeća omogućava bržu i lakšu socijalnu, radnu i psihološku adaptaciju u organizacijsku sredinu, temeljem čega novopridošli kadar formira dobre radne navike, brže se osposobljavaju za poslove za koje su primljeni i u kraćem vremenskom periodu mogu pružiti maksimum kompaniji koja ih zapošljava. Zaključak je da obuka IT kadrova zavisi prvenstveno od potreba i skupa tehnologija koje su neophodne za obavljanje posla u organizaciji ili u određenom profilu poduzeća. Kontinuirano obrazovanje je široko i može se kretati u pravcu specijalizacije IT stručnjaka za sigurnost, enkripciju podataka, mreže i razne vrste integracija, kao i za određene operativne sisteme, aplikacije, servise, rešenja i serverske tehnologije.

Od svih ispitanika koji su sudjelovali u istraživanju najviše je direktora/generalnih direktora 21%, članova uprave ili izvršnih direktora 15 %, savjetnika uprave 5%, voditelja službe/ureda za IT 26% od čega je samo 5% ženskih ispitanika.

Na kvalitetu pojedinca kao zaposlenika najznačajniji utjecaj kad su u pitanju pojedinačni odgovori jeste Obrazovanje, što misli preko 65% svih ispitanika, dok je za uspješnog pojedinca kao zaposlenika čini odgoj, obrazovanje i interno okruženje poduzeća, što smatra preko 38%.

Generalni zaključak je da sve tvrtke koje su sudjelovale u istraživanju IT-a smatraju kako kvaliteta kadrova *doprinosi poslovnom uspjehu poduzeća*, a pri tome 36,8 ispitanika smatra da u potpunosti doprinose i to njih 63,2%.

Abstract:

SELECTION OF QUALITY STAFF FOR JOBS IN THE IT SECTOR

In today's modern and globalized world, the success of business organizations largely depends on the quality of the organization's employees. Employees led by managers are responsible for the success of the organization in achieving organizational goals. The question is what defines a quality employee, how does the organization find such employees, and how does the organization encourage and participate in their development and raising the quality of work? The activity that records rapid development and growth of business is the area of IT, IT activity records the development and increase of the number of employees in HNŽ located in BiH. This paper will present the results of research conducted on several companies dealing with information technology in HNC. The research is based on questions that provide answers about the quality of employees, the recognition of such employees, the quality of their work and the development and raising the quality of employees. In addition to the above questions about the quality of employees, the contribution of such staff to organizational success will be investigated.

Key words: quality, information technology activity, employee quality, work quality.

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QUALITY OF SMART CONCEPT IN SMALL CITIES (5G, IoT, Big Data, ...)

**KVALITETA PAMETNOG KONCEPTA U MALIM GRADOVIMA
(5G, IoT, Veliki podaci, ...)**

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Pregledni članak/*Review*
Jezik/*Language*: Engleski/*English*

ABSTRACT

The concept of the Smart City is progressively picking up notoriety and characterizes an approach that employs Information and Communication Technology (ICT) to support the diverse features of maintainability forms, whereas taking into thought the interface of distinctive partners. In the future, 5G innovations will interface the world from the biggest megacities to the littlest Internet of Things(IoT) in a continuously on-line design. Smart City has circulated over the created world-impacting quality urban change programs and government strategies. Such future cities are announced for their capable networked technologies embedded interior the surface of urban circumstances that allow unused in-fers of social control for the state, such a connected hierarchy must combine the smart cities, the smart domestic, and the Internet of Things into one huge coherent framework. With the exponential development of technologies such as 5G, the Internet of things (IoT), a Cloud of Things (CoT), and dispersed Artificial Intelligence(AI) associated by means of inescapable and always-connected Machine-to-Machine (M2M) communications (5G). utilizing sensors arrangement

counting smart domestic sensors, vehicular networking, climate and water sensors, smart parking sensors, surveillance objects, etc. Joining the Internet of Things (IoT) in citizens' lives empowers the advancement of new intelligent administrations and applications that serve segments around the city M2M, IoT, and high-speed video services produce a high volume of data within the communication networks.

Keywords: Smart Cities, 5G, IoT, CoT, M2M, AI, Big-Data.

1. INTRODUCTION

The developing research of the 5G network reached in a 2020 is already changing numerous viewpoints within the communications scene. The fast advancement of the IoT and Big data is regularly considered the most factor within the execution of smart cities' services.¹ The persistent evolution of technology plays a critical part in the advancement of clever frameworks over different spaces of city quality of life of individuals by excelling in numerous key zones: safety, sustainability, and economic development. Transportation is one key figure that essentially influences the socio-economic advancement of smart cities.² Any sort of inefficiency in this basic network can cause enormous loss of time, devaluation within the level of safety, high pollution, and debasement within the quality of life. A smart city benefits from information collection and handling utilizing diverse technologies of communication, networking, and computing, which in turn leads to the development of smart services over diverse divisions counting health, transportation, security, and more. A future smart city infrastructure must be able to coordinate the smart area into a coherent smart city concept. Vitale components in this concept are the Internet of Things (IoT), Clouds of Things (CoT), and Artificial Intelligence (AI) connected through inescapable and always-connected M2M communications (5G). M2M and IoT are two crucial components in smart cities that produce Big data. They are the most parts of 5G and have a vital part in constituting 5G.³ The most objectives of 5G mobile communications have been partitioned into four services:

¹ Ibrahim Abaker, Targio Hashem, Victor Chang, Nor Badrul Anuar, Kayode Adewole, Ibrar Yaqoob, Abdullah Gani, Ejaz Ahmed, Haruna Chiroma, „The role of big data in smart city“, *International Journal of Information Management*, 36, 2016, pp 748–758.

² Mohammad S. Obaidat, Petros Nicosopolitidis, Morgan Kaufmann Eds., *Smart Cities and Homes: Key Enabling Technologies*, 2016.

³ Jahangir Dadkhah Chimeh, Mojtaba Mazoochi, „Approaching to Mobile 5G Communications, Advances in Intelligent Systems and Computing“, Springer, July, 2018.

- Developing and progressing communication services like eHealth and eBanking.
- Communication between all equipment through remote systems like IoT and M2M.
- Generation and transportation high volume of data.
- High-speed videos.

This technology gives capacity to imitate human characteristics such as seeing, hearing, considering, and decision-making in arrangements to communicate, share data, and facilitate activities with one another. These capacities change basic objects into clever gadgets that can work in genuine time, alter to the circumstances, and work without human intercession or supervision. Similar smart sensors and actuators are already inserted in numerous areas of cities, which allow rise to a collection of gigantic sums of data.⁴ The accumulated data must be stored, analyzed, and prepared before being displayed in a valuable frame.⁵ The associated IoT technology will coordinate the Web as we know it into a huge number of things,⁶ and consequently, commonly known objects such as dress, nourishment packing, toothbrushes, etc. will be prepared with a few levels of Internet addressable AI. Hence, these IoTs will offer setting mindfulness and communication highlights, and they will share a few levels of pseudo-intelligence depending on their preparing capability and expended control confinement.⁷ Here, a critical point is diverse data structures and information sources like video, mail, web browsing, eHealth, and M2M communications that ought to be taken care of at the same time. We proposed to present 5G mobile communications frameworks as an infrastructure for supporting the over in this paper we audit, M2M, IoT, Big Data necessities and details in this paper. Numerous smart cities still exist nowadays, and a few of them are drawing nearer 100% energy freedom through renewable vitality. This paper points to show the characteristics of little smart cities and to analyze their determinants.

⁴ Randy Frank, *Understanding smart sensors*, 2013, pp. 1-2.

⁵ Min Chen, Shiven Mao, Yin Zhang, Victor C. M. Leung, *Big data: related technologies, challenges and future prospects*, 2014.

⁶ Commission of the EC, “*Internet of Things - An action plan for Europe*,” EU, Brussels, 2009.

⁷ Jianhua Liu, Weiqin Tong, “*Dynamic Services Model Based on Context Resources in the Internet of Things*,” in *Wireless Communications Networking and Mobile Computing (WiCOM)*, 6th International Conference on, 2010.

2. INFLUENCE OF QUALITY TO THE SMART CITY CONCEPT

In 1950 about 65 percent of the population worldwide lived in rural settlements and 35 percent in cities; this number will be reversed by 2050, where 70 percent of the population will be expected to live in urban areas while only 30 percent will be living in rural areas.⁸

Literature reveals that society is faced with a large number of security issues, justifying the need for Smart Cities to continue thinking about ways to address the problem. The increment within the urban populace increments the require for mobility and the expanding utilization of nourishment and energy. This leads to an increment in living costs, the misfortune of time (e.g. in traffic), and to the improvement of poor living habits. That's why there's a have to discover inventive arrangements that will move forward the quality of life of citizens and ensure sustainable economic development in small cities, to protect the districts from over-urbanization. The solution to these issues lies within the concept of small smart cities and advanced technologies. The Smart City concept involves various application areas.

In smart cities light of roads, air pollution, vehicle counters, electric utilization counters, smart cams, temperature and humidity sensors, etc. are controlled through IoT. Six vital criteria in a smart city are the smart economy (Bourse, eBanking, etc.), smart transportation, smart environment, smart citizens, smart behavior, and smart organization e.g. e-Government. These layers incorporate equipment framework in layer1 and smart applications in layer 2. Smart individuals can be within the third layer. Other than that, smart cities ought to incorporate quickening agents and new companies. New companies like Web taxis, computerized stores, and on our companies based on modern technologies. Accelerators are supporters of new businesses in several development steps.

The United Nations Agencies (2016), however, have defined a Smart City as a sustainable and innovative city that uses ICTs and other means to improve the quality of life in urban areas and the efficiency of operations and competitiveness, without harming the future progress in the city concerning social, environmental and economic wellness. However, cities of all sizes can become smart because the foundation of every smart city is the ability to collect and use data collected using different sensors. Small cities face challenges in implementing smart solutions. Interesting and useful innovations can also be found in smaller cities that have unexpected solutions, just to

⁸ UNCTAD, *Smart Cities and Infrastructure*. Retrieved from https://unctad.org/meetings/en/SessionalDocuments/CSTD_2015_Issuespaper_Theme1_SmartCitiesandInfra_en.pdf, 2016.

cope with the lack of money, experts, or the necessary infrastructure. Some of the advantages that come with smaller cities are easier to overcome regulatory hurdles, as fewer people slow down the process.

3. ICT TECHNOLOGIES FOR SMALL SMART CITY DEVELOPMENT

The future smart cities require ICT technologies as a center to be able to handle the inventive smart city challenges. These ICT innovations must join a strong, sustainable, and profoundly leveraged network that gives network, smartness, security, and effective vitality administration. Within the following, the most contributing technologies are discussed. They are 5G, Big data, IoT, Cloud of Things (CoT), Artificial intelligence (AI), Intelligent Transportation (IT).

3.1. 5G

The 5G organize is the fifth generation of remote broadband systems, advertising speeds, and reliability that outperform its 2G, 3G, and 4G fore-runners. 5G is based on the utilize of a building structure joining the customary macro-cellular organize with an overlay of little cell networks.⁹ This permits clients to connect to two systems at the same time. The double network permits the macro-cellular arrangement to act as the control plane and the little cells to act as the client plane. The control plane is dependable for signaling between networks and the client plane is allotted for information services (e.g. video spilling or calls). The utilize of two isolated (however intercommunicating) systems extraordinary to make a higher-performing network. Top data rates for the modern 5G network have been detailed to be within the run of 5.8-10 Gbps, with Vodafone UK detailing normal speeds of 150-200 Mbps.¹⁰ Hypothetically, at top rates, the modern network will be at the slightest two orders of size speedier. Concurring to Life wire, in arrange to stream 4K Ultra HD substance on YouTube, a speed of at slightest 15 Mbps is

⁹ Shozo Okasaka, Richard J. Weiler, Wilhelm Keusgen, Andrey Pudeyev, Aleksander Maltsev, Ingolf Karls, Kei Sakaguchi, *Proof-of-Concept of a millimeter-wave integrated heterogeneous network for 5G cellular*. Sens (Basel), 2016, p.16:1362.

¹⁰ Authority ACaM. *5G and mobile network developments-emerging issues*. Melbourne (VIC): Australian Communications and Media Authority, 2016. <https://www.acma.gov.au/theACMA/5g-and-mobile-network-developments>. Vodafone, *5G: how fast is 5G?* Newbury(UK): Vodafone UK, 2020.

required to stream without interferences.¹¹ Representation of the 5G network. The control plane speaks to the division of 5G dependable for foundation communication between networks. The client plane speaks to the systems dependable for information services. The client, macro cellular, and small cell systems all intercommunication (double-sided bolts) and work in collaboration. Remote cellular systems, such as 5G have generally been optimized for on-the-go networks, while the other systems (e.g. cable, fiber optic) offer more steady network required in changeless structures. The new 5G works at millimeter-wave bands (24, 28, 37, and 39 GHz) and mid-spectrum bands (2-3 GHz) in expansion to the (1-2 GHz) range utilized by current generation wireless systems.¹² The foremost outstanding challenge with millimeter-wave frequencies is that they have trouble entering thick building structures or foliage. Usually due to these wavebands being of a shorter wavelength and hence incapable to proliferate through high-density structures.¹³ Telecom suppliers are pointing to overcome the challenges of the indoor dependable network through the utilize of small cells, with suppliers pointing to extend the number of little cells by 900% from 2018 to 2026.¹⁴ Besides, the likely lower costs and expanded proficiency of building up 5G makes the remote network favored over devoted fixed-line communication for broad use. Even if the points of interest of the long run 5G frameworks are distant from known or concurred upon, however, the general qualities recognizing it from the current frameworks counting (Long Term Evolution) LTE Progressed are rising in sensible agreement in introductions from hardware producers and scholastics.¹⁵

¹¹ Lifewire, *Internet speed requirements for video streaming*. New York City (New York, USA): Dotdash, 2019. <https://www.lifewire.com/internet-speed-requirements-for-movie-viewing-1847401>.

¹² National Academies of Sciences Engineering, and Medicine; Policy and Global Affairs; Government University-Industry Research Roundtable; Saunders J. The transformational impact of 5G. In: *Proceedings of a workshop—in brief*. Washington DC (USA): National Academies Press (US); 2019 <https://www.ncbi.nlm.nih.gov/books/NBK547761/>.

¹³ Christopher Wallace, *Bringing 5G networks indoors*. Stockholm (SWE): Ericsson, 2019. <https://www.ericsson.com/en/reports-and-papers/white-papers/bringing-5g-networks-indoors>.

¹⁴ Sue Marek, *Marek's Take: making 5G work indoors is a huge task for operators*, New York (USA): Fierce Wireless, 2019. <https://www.fiercewireless.com/wireless/marek-s-take-making-5g-work-indoors-a-huge-task-for-operators>.

¹⁵ Moiin Hossein, "Looking ahead to 5G - A symbiotic convergence of new and existing technologies," in EUCNC, Bologna, Italy, 2014. Osseiran Afif, "5G beyond the hype" *Ericsson Business Review*, Vol. 2, 2014.

3.1.1. 5G specifications

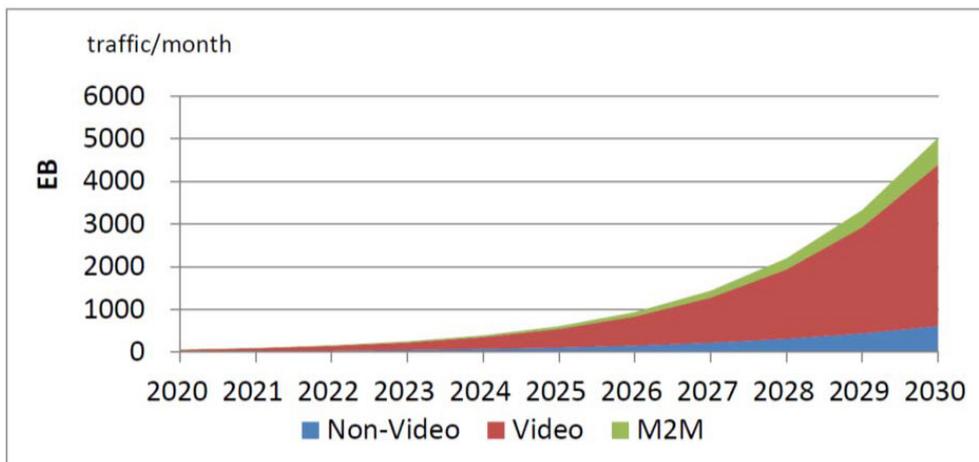
5G is based on Massive Machine-Type Communications (mMTC) may be a device-centric one and is related to the number of connected gadgets in a smart city, Ultra-reliable and Low-Latency Communications (URLLC) is related to users sensitive to latency/delay and reliability. This can be used for wireless controlling the industrial facilities and independent vehicle and remote surgery operations, and Enhanced Mobile Broadband (eMBB) benefit may be a human-centric benefit which is utilized to transmit video substance and is based on information rate, activity capacity, and ghastly proficiency. In this way, the 5G framework ought to incorporate. Tall activity, high thickness, and high portability machines, Web services like UHD video streaming and AR, and IoT, smart domestic, and smart grid.

We consider the **5G core** from a few diverse focuses of view as follows. In 3GPP (3rd Generation Partnership Project) there are two proposals for 5G. To begin with the arrangement, 5G employments LTE core and as it were the get to the area is based on 5G New Radio (5G-NR). Within the second arrangement, 3GPP has recommended modern core and get to areas. The foot layer incorporates UE which is associated with the Access /Fixed Network (AN/F) and client plane work. The upper layer incorporates virtualized capacities such as AMF (Access and Mobility Management Function), SMF (Session Management Function), NSSF (Network Slice Selection Function), etc. Agreeing to this arrangement, LTE-EPC ((Long Term Evolution-Evolved Packet Core) and other agreeable segments has been advanced to virtualization organize and cloud innovations.

3.2. Big data

The utilize of IoT and other future web innovations give a gigantic sum of data (Big Data). This information ought to be appropriately analyzed and overseen to extricate designs, which are useable for applications, services, and integrated ICT approaches like public health, public data frameworks, city administration, energy proficiency, transport, security, and crisis services, squander administration, and water management. Common for these services is that the information requires procurement, capacity, and handling on either a nearby smart city server or on a cloud preparing stage.

Fig. 1. Mobile Estimation.¹⁶



Handled information can be utilized for creating new services such as smart economy, smart governance, smart environment, and smart portability. Probabilistic data structures (PDSs) are greatly helpful information structures that diminish the time and space trade-off to an extraordinary degree comparing to capacity and recovery and questioning of information.¹⁷ **Big Data** has three characteristics as **volume**, **speed**, and **diversities**. A Big Data activity volume may be Petabytes or Exabyte constituted from billion or trillions of bits of information from millions of individuals or hardware. (Fig. 1) appears that the volume of M2M traffic approaches 5013 petabytes by 2019. It outlines non-video, video, and M2M portable traffic sorts particularly. Video traffic approaches to 4200EB and non-video traffic such as IoT and eHealth approaches to 600 EB.

3.2.1. Big data challenges¹⁸

1. **Data capture:** since distinctive traffic sorts with high speeds enter the organized frame exceptionally diverse paths/ports, at that point sensors, terminals, and information accumulation strategies are exceptionally vital and basic within the following generation framework.

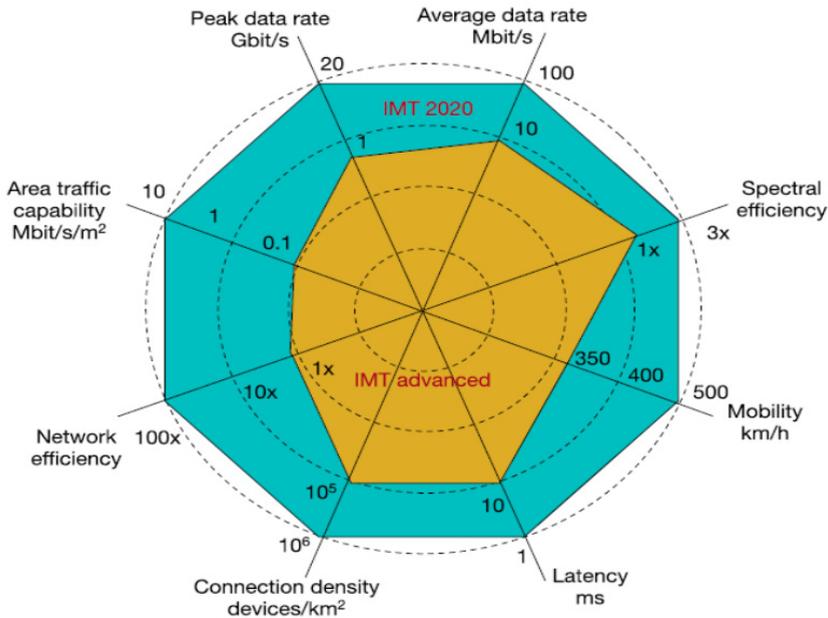
¹⁶ Report ITU- Report M.2370-0, July 2015.

¹⁷ Sourav Dutta, Ankur Narang, Suman K. Bera, "Streaming Quotient Filter: A Near Optimal Approximate Duplicate Detection Approach for Data Streams," *Proc. VLDB Endowment*, Vol. 6, No. 8, 2013, pp. 589-600.

¹⁸ Judith S. Hurwitz, Alan Nugent, Fern Halper, Marcia Kaufman, *Big Data for dummies*, A Wiley brand, John Wiley & Sons, Canada, 2013.

2. **Sparing the data:** since the information volume is exceptionally much we require information centers and high capacity within the following generation systems to spare them. Diverse information groups are another vital challenge here.

Fig. 2. QoS 5G parameters evolution.¹⁹



3. **Information examination:** in arrange to analyze the information we require information program extractors and analyzers with the progressed determinations. In expansion to them, organizations require information mining and knowledge revelation here to utilize them in their methodology and generation administration.

Hence, we require high-speed joins in discuss interface, core, and back-haul within the next-generation systems. In expansion, we require the following generation systems to cover all innovations (2G, 3G, etc.). Besides, we require high capacity information centers with quick information sparing and recovering and in expansion, various data aggregators/ de-aggregators, cloud computing, and high-performance applications, and high power handling

¹⁹ Ali Zaidi, Fredrik Athley, Jonas Medbo, Ulf Gustavsson, Giuseppe Durisi, Xiaoming Chen, "5G Physical Layer, Principles, Models and Technology Components", Elsevier, 2018.

equipment. Because it appears in (Fig. 2) vital parameters are bit rate, latency, number of concurrent connections, energy and cost-effectiveness, high portability, and spectral efficiency within the following generation systems, e.g. 5G. For case, speed of 250km/h moves forward to 500km/h in 5G.

3.3. Internet of Things (IoT) and M2M

Internet of Things (IoT) alludes to the linkage and associations among billions of distinctive objects over the web to create a smart environment. Based on standardized communication conventions, these gadgets share and trade data over heterogeneous stages.²⁰ Thus, IoT upgrades the interactivity and the effectiveness of basic frameworks such as those utilized in transportation, security, instruction, agriculture, and healthcare. The IoT is considered another huge step within the advancement of the Web. The EU Commission has composed an IoT activity arrange for Europe,²¹ expressing that IoT will definitely adjust the way our social orders work within the coming 5 to 15 years. A combination of Web and emerging technologies like remote communications, setting awareness and inserted remote sensor systems change regular objects into brilliantly and context-aware IoTs. These IoTs will offer setting mindfulness and communication highlights, and they will share a few levels of pseudo-intelligence depending on their preparing capability and expended control restriction.²² It has been anticipated that 7 trillion wireless gadgets utilized by 7 billion individuals in 2020, i.e. more than a thousand gadgets for each human on the soil,²³ numerous of these will be IoTs. IoT and M2M are utilized in Smart Cities. In IoT, sensors are controlled through the Web and incorporate all interactions between humans/apps/things. As the predecessor to the IoT, M2M has been utilized all through the decades as the standard innovation in telemetry indeed before the development of the Web itself, because it included an interaction between two or more machines without human intervention. Briefly, IoT may well be seen as M2M, but acting in a more extensive setting.

²⁰ Jayavardhana Gubbi, Rajkumar Buyya, Slaven Marusic, Marimuthu Palaniswami, "Internet of things (IoT): A vision, architectural elements, and future directions", *Future Gener. Comput. Syst.* 29, 2013, pp.1645-1660. <https://doi.org/10.1016/j.future.2013.01.010>

²¹ Commission of the EC, "*Internet of Things - An action plan for Europe*," EU, Brussels, 2009.

²² Jianhua Liu, Weiqin Tong, "Dynamic Services Model Based on Context Resources in the Internet of Things," in *Wireless Communications Networking and Mobile Computing (WiCOM)*, 2010, 6th International Conference on, 2010.

²³ David Klaus, "Technologies for the Wireless future," in, Vol 3, 2008. <http://dx.doi.org/10.1002/9780470994467>.

3.4. IoT architecture

IoT architecture includes four levels: **Hardware**, this level is comprised of different smart gadgets, counting sensors, and actuators that can make and process signals. Sensors capture information and collect data from the environment, whereas actuators are dependable for changing electrical signals into substantial activities. Sensors collect data in real-time, which in turn empowers the interconnection among physical devices and computerized systems.²⁴ **Network and communication middleware**, In most cases, the information collected from sensors is put away within the cloud. Network and communication middleware is capable for IoT design.²⁵ **Big data capacity and analytics**, The information collected by IoT must be put away and analyzed to extricate profitable information that can back decision-making.²⁶ **IoT applications**, is the final level of IoT **architecture**. IoT can be utilized in different applications utilized over a few segments, healthcare, surveillance, counting transportation, farming, smart buildings, and energy administration. These applications empower the environment to order smart, real-time behaviors and activities. IoT applications produce expansive sums of information in several designs, counting pictures, recordings, and sound.

3.4.1. Blockchain to secure IoT.

As of late, blockchain innovation has pulled in the consideration of analysts totally different zones. Xie et al, have characterized the blockchain as “a grouping of pieces, which holds a total list of exchange records like customary open ledger”.²⁷ Blockchain was presented to back the usage of security techniques, but it has found employments in numerous other areas and zones of application as well. To improve the security of IoT applications, the thought of receiving blockchain with IoT applications was proposed.²⁸ For

²⁴ Subhas Chandra Mukhopadhyay, Wearable sensors for human activity monitoring: A review, *IEEE Sensors J.* 15, 2015, pp. 1321-1330.

²⁵ Mehdi G. Mohammadi, Ala Al-Fuqaha, *Enabling cognitive smart cities using big data and machine learning: Approaches and challenges*, *IEEE Commun. Mag.* 56, 2018, pp. 94-101.

²⁶ Ejaz Ahmed, Ibrar Yaqoob, Ibrahim Abaker Targio Hashem, Ihram Khan, Abdelmutlib Ibrahim Abdalla Ahmed, Muhammad Imran, Athanasios Vasilakos, *The role of big data analytics in Internet of Things*, *Comput. Netw.* 129, 2017, pp. 459-471.

²⁷ Xie, Z., Dai, S., Chen, H.-N., & Wang, X. *Blockchain challenges and opportunities: a survey*, *Int. Congress Big Data 14*, 2018, pp. 352-375.

²⁸ Tiago Fernández-Caramés, Paul Fraga-Lamas, *A review on the use of blockchain for the internet of things*, *IEEE Access* 6, 2018, pp. 32979-33001.

smart cities, blockchain makes a difference to construct a secured environment for their applications by adopting decentralized designs.²⁹ Blockchain smart contracts are promising and advantageous innovations that can be utilized to manage forms between benefit suppliers and clients.³⁰

3.5. Cloud of Things (CoT)

The CoT is imperative within the smart zone and small smart city settings since IoT gadgets deliver a gigantic amount of data that must be stored and prepared. In basic terms, a CoT could be a pool of assets and calculation capabilities open through the Web. For smart cities combining IoT and CoT is significant, so that IoT information can be prepared and stored.³¹ Combining the pieces, an advanced ICT-based framework must include technologies such as 5G, IoT, CoT, and AI. Particularly, the AI portion is challenging since it is inserted into the IoT setting, which offers restricted assets.

3.6. Artificial Intelligence (AI)

Artificial Intelligence (AI) could be a generalized term utilized to portray a framework that shows the properties of human intelligence. An Advanced AI (AAI) framework is required for handling complex IoT designs, By combining AAI frameworks, utilizing 5G to get to the Web and the CoT administrations, the ICT premise for a smart city is made as an Integrated Smart Home and Smart City (ISHSC).³² The application zone for AI covers a wide run of applications such as toys, logical investigation instruments, medical determination, and robot control. In expansion, numerous of today's administrations are based on inserted AI, cases are self-navigating, recommender motors, gaming motors, cars gearboxes, discourse acknowledgment, and mechanical robots. Smart situations within the smart zone have to actualize context-aware services that are able to bargain with everyday exercises, such as preparing, eating, drinking, taking pharmaceuticals and cooking, etc.

²⁹ Muhammad Salek Ali, Massimo Vecchio, Miguel Koustabh Dolui Pincheira, *Tutorials, Applications of blockchains in the internet of things: A comprehensive survey*, IEEE Commun. Surv. Tutor., 2018, pp. 1676-1717.

³⁰ Edy Portmann, *Blockchain: Blueprint for a New Economy*, Springer Fachmedien Wiesbaden GmbH, 2018.

³¹ Tatsuya Yamazaki, "Beyond the Smart Home," in *International Conference on Hybrid Information Technology*, 2006, pp. 350-355.

³² Trishan Panch, Peter Szolovits, Rifat Atun, *Artificial intelligence, machine learning and health systems*. J Glob Health.

These frameworks must be able to interface with hundreds or indeed thousands of sensors.³³ In expansion, they have to be able to bargain with voluminous and wealthy information, which is exceptionally challenging for the AI learning and expectation process.³⁴

3.7. Intelligent Transportation (IT).

Intelligent Transportation (IT) incorporates three sorts: vehicle to individuals, vehicle to vehicle, and vehicle to the framework which are named to V2X. V2X empowers the drivers to be educated of plausible threats and mischances on the street.

We require a comprehensive framework and high-speed backhaul to abuse V2X services. In M2M associations are peer to peer and communication is set up through a channel. M2M traffic per month takes off and comes to 4.4 petabytes by 2019 and approaches 5016 EB in 2030. Other than, we found that the traffic volume increments quickly after 2019. These volumes of traffic make enormous information. M2M traffic is little in measure but is produced exceptionally much.

4. SMART CONCEPT INTEGRATED WITH SMART CITY

The essential concept of the smart city is to induce the right data at the correct place on the device at the right time to create the city-related choice with ease and to encourage the citizens in more-speedy and fast ways. To create the IoT-based smart city, we sent a few remote and wired sensors, observation cameras, emergency buttons inroads, and other settled devices. The most challenge is to attain a smart city framework and connect smart system created information at one place. We do this by putting the most data center connecting all smart framework to have them at a central place. In arrange to urge Real-time city information, we proposed to send numerous sensors at diverse places to realize smart homes, smart parking, weather and water systems, vehicular traffic, environment population and surveillance system. These frameworks are used by the authorities to create clever choices based

³³ Diane J. Cook, "Learning Setting-Generalized Activity Models for Smart Spaces," IEEE Intelligent Systems, Vol. 27, No. 1, 2012, pp. 32-38.

³⁴ Michele Dominici, Giulio Zecca, Frédéric Weis, Michel Banatre, "Physical Approach in Smart Homes A Proposition and a Prototype," in Proceedings of the Third conference on Smart Spaces and next generation wired, and 10th international conference on Wireless networking, 2010, pp. 111-122.

on the real-time information to set up the smart city. ‘Smart Homes’ have been a dynamic specialized investigation zone for decades. These systems are used with the technological improvement of the living environment in arrange to offer back to occupants and progress their quality of life.³⁵

‘Smart Cities’ has been created to make a stronger maintainable and cost-productive urban environment.

Final, the foremost critical thing for the individuals of the smart city is the security concerns. Security is accomplished by the proposed framework by continuously observing the video of the entire city. In any case, it is exceptionally difficult to analyze all city recordings and distinguish any disaster from anybody in real-time by the framework. To overcome this restriction, we propose modern scenarios, which increment the security of the framework of the total city. We put different emergency buttons counting amplifiers at distinctive places of the city with surveillance cameras. When any incident happens with anybody like theft, car stolen, etc. He can just thrust the crisis button at any close place, and it’ll send the message to the closest police station, etc. In this way, the police or security offices can begin observing the adjacent areas through observation cameras and can rapidly find the faker. The IoT innovation coordinating the Web into a large number of things. In this way, commonly known objects. will be prepared with a few level of Internet-addressable AI, setting mindfulness, and communication highlights. Based on these technologies IoT’s will give a few levels of pseudo intelligence depending on their preparing capability and expended power restriction.³⁶ The IoT’s contained within the smart homes capture relevant data that describes the continuous exercises. By utilizing manufactured intelligence to analyze the given data the smart homes are able to memorize the user’s behavior and offer modern services agreeing to our inclinations. A part of the investigation is required in this zone.³⁷

The CoT innovation could be an imperative player since it handles the gigantic sum of data produces by IoT devices. In basic terms, a CoT could

³⁵ Balasubramanian, K., & Cellatoglu, A. “Improvements in home automation strategies for designing apparatus for efficient smart home,” *Consumer Electronics, IEEE Transactions on*, vol. 54, no. 4, 2008, pp. 1681-1687.

³⁶ Jianhua Liu & Weiqin Tong, “Dynamic Services Model Based on Context Resources in the Internet of Things,” in *Wireless Communications Networking and Mobile Computing (WiCOM)*, 2010 6th International Conference on, 2010. Mingyi, M., Qian M., Qingfu H., Jianjun L., & Zhicheng C., “Solution to Intelligent Management and Control of Digital Home,” in *Biomedical Engineering and Informatics (BMEI)*, 2010 3rd International Conference in China, 2010.

³⁷ Commission of the EC, “*Internet of Things - An action plan for Europe*,” EU, Brussels, 2009.

be a pool of assets and calculation capabilities interconnected by the Web. For smart cities combining IoT and CoT is significant, as this permits IoT information to be handled and stored.³⁸ The IoT devices show challenges as they got to communicate with each other (M2M communication); they have to communicate with the cloud administrations which collect Big data, and they got to prepare complex information utilizing AI. To handle these challenges counting the gigantic sum of information included, 5G technologies are required.

Moreover, sustainable assets like water, solar-based heating, wastewater, and power generation systems can be facilitated to supply nearby and worldwide reserve funds. In government, organization, and open security services separated from the refinement of ordinary e-government, e.g., a framework may be advertised where charges are specifically related to the asset utilization and the observed pollution level by utilizing the collected Big data that are spared on the cloud servers. Intelligent Traffic Systems (ITS) may be taken to a modern level by combining real-time traffic data and client needs/requests for transportation to control traffic and offer Transportation.

5. CONCLUSION

In conclusion that it is secure to anticipate that Smart City Technologies and Services (SCTS) raise extraordinary concerns over personal security, they will still be utilized in empowering urban advancement. Their possibilities for making strides within the quality of life, worldwide commerce, the economy, attraction tourism and persuade and the environment are removed as well promising, which is why “Smart Cities” have finished up a course of action framework recognized on the all-inclusive level and an objective of various national methodologies. The smart city includes a major effect on the country’s economy. A solid and smart city framework helps in taking fast and clever choices.

This paper centers on the execution of the smart city by the utilize of the IoT-based smart framework. Different smart systems are utilized to urge real-time city information to create a decision. The ecosystem is utilized to handle Big Data created by all the smart frameworks conveyed within the city.

There are millions of associations and trillion bits of data within the following systems. Hence, we require millions of input/output ports, high-speed

³⁸ Yamazaki T., “Beyond the Smart Home,” in *International Conference on Hybrid Information Technology*, 2006, pp. 350-355.

joins, high capacity storage, and effective equipment within another system. They all demonstrated that 5G is able to support the following necessities and may be well suited for next-generation systems.

These potential improvements presuppose arrangements to a push of socio-technological challenges counting different zones such as 5G communication technologies, dispersed AI, CoT-based services, security, belief, and privacy. Arrangements to these will require gigantic investigation efforts utilizing inventive standards, techniques, and strategies. The laid out framework is inherently a user-centric framework that will give a stage for a new eco-system based on modern socio-economic structures.

Sažetak:

KVALITETA PAMETNOG KONCEPTA U MALIM GRADOVIMA (5G, IoT, Veliki podaci, ...)

Koncept pametnog grada postupno postaje poznat i karakterizira pristup koji koristi informacijsku i komunikacijsku tehnologiju (ICT) za podršku različitim značajkama oblika održivosti, uzimajući u obzir sučelje različitih partnera. U budućnosti će 5G inovacije povezivati svijet od najvećih velegradova do najmanje Interneta stvari (IoT) u kontinuiranom online dizajnu. Pametni grad doprinio je stvorenim kvalitetnim programima urbane promjene i vladinim strategijama koji utječu na svijet. Takvi budući gradovi najavljuju se zbog svojih sposobnih umreženih tehnologija ugrađenih u unutrašnjost površine urbanih cjelina koje dopuštaju neiskorištene mogućnosti društvene kontrole za državu, takva povezana hijerarhija mora kombinirati pametne gradove, pametnu kuću i Internet stvari u jedan koherentan okvir. S eksponencijalnim razvojem tehnologija kao što su 5G, internet stvari (IoT), oblak stvari (CoT) i raspršena umjetna inteligencija (AI) povezana je putem neizbježnog i uvijek povezanog stroja za stroj (M2M) komunikacije (5G) korištenjem rasporeda senzora koji broji pametne kućne senzore, umrežava vozila, klimatske i vodene senzore, pametne parkirne senzore, nadzorne objekte itd. Pridruživanje Internetu stvari (IoT) u živote građana osnažuje napredak novih inteligentnih administracija i aplikacija koje služe segmentima oko gradske M2M, IoT i video usluge velike brzine te proizvode veliku količinu podataka unutar komunikacijskih mreža.

Key words: pametni gradovi, 5G, IoT, CoT, M2M, AI, veliki podaci.

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UTJECAJ TEHNOLOŠKIH PROMJENA NA KVALITETU POSLOVANJA I GLOBALIZACIJU

THE IMPACT OF TECHNOLOGICAL CHANGES ON
BUSINESS QUALITY AND GLOBALIZATION

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SAŽETAK

Tehnološki napredak te konstantni i brzi razvoj novih informacijsko – komunikacijskih tehnologija stvara mnogobrojne promjene na tržištu ali i u menadžerskom upravljanju organizacijom. Globalizacija kao i tehnologija razvijaju se kroz vrijeme te obuhvaćaju sve više aspekata ljudskog života ali i nadasve utječu na poslovno okruženje. Globalizacija te konstantni rast i razvoj novih tehnologija potaknuli su da tržišta i svi njihovi sudionici postaju interaktivni, prepoznatljivi, fleksibilni, inovativni i brži te da kvalitetnije sudjeluju u razmjeni novih znanja i tehnologija. Osim što nove tehnologije imaju pozitivan utjecaj na cjelokupno društvo te društveno-ekonomski napredak sudjeluju i doprinose stvaraju konkurentne prednosti na globalnoj razini te pridonose kvaliteti poslovanja. Cilj rada je: (1) analizirati indeks razvijenosti informacijsko – komunikacijskih tehnologija (eng. ICT Development Indeks (IDI)); (2) analizirati indeks globalizacije (eng. KOF Globalisation Indeks); (3) analizirati povezanost promatranih indeksa te ocijeniti položaj RH prema spomenutim indeksima.

Ključne riječi: tehnologija, tehnološki napredak, informacijsko – komunikacijske tehnologije, digitalne tehnologije, indeks razvijenosti informacijsko

– komunikacijskih tehnologija (ICT Development Indeks (IDI)), indeks globalizacije (KOF Globalisation Indeks), Republika Hrvatska.

1. UVOD

Druga polovica 20. st. obilježena je informacijskom revolucijom, naglim razvojem računalne industrije. Razvoj i napredak informacijsko – komunikacijske tehnologije obilježen je nastankom i razvojem Interneta početkom 60-tih godina. Upravo njegovim razvojem može se govoriti o globalnoj računalnoj mreži koja nudi velik broj informacijskih sadržaja i komunikacijskih usluga. Internet i nove informacijsko – komunikacijske tehnologije mijenjaju način prikupljanja i pohranjivanja podataka i informacija ali i način komuniciranja te daju nove mogućnosti i novu dimenziju današnjem poslovanju. Ključan pokretač rasta i razvoja mnogih gospodarstava je upravo rast, razvoj i primjena novih informacijsko – komunikacijskih tehnologija. Uslijed snažnog tehnološkog razvoja koji konstantno traje dolazi do mnogobrojnih promjena i stvaranja mnogobrojnih izazova i prepreka na koje organizacije trebaju moći znati odgovoriti. Upravo im danas nova tehnologija uvelike olakšava ali i otežava poslovanje. Biti u koraku s tržištem, a naročito na globalnoj razini, pred poduzeća stavlja izazov u pogledu prepoznavanja, implementacije i primjene novih informacijsko – komunikacijskih tehnologija, kako bi odgovorila na potrebe tržišta ali i postala i ostala konkurentna.

Nove tehnologije, inovacije, razmjena znanja danas pokreću tržišta, poslovanje i kreiraju poslovno okruženje koje postaje konkurentsko i nadasve kvalitetno. Kvaliteta poslovanja osnova je za ostvarivanje konkurentске prednosti, stvaranje visoke razine produktivnosti i minimizacije troškova. Konstantni razvoj novih tehnologija upućuje na njezinu sve veću primjenu i jačanje indeks razvijenosti informacijsko – komunikacijskih tehnologija (IDI) pri čemu i sam razvoj kvalitete poslovanja te u konačnici upravljanje kvalitetom doprinosi istom. Indeks razvijenosti informacijsko – komunikacijskih tehnologija smatra se jednim od glavnih faktora rasta produktivnosti, inovativnosti i zaposlenosti.¹

U radu je moguće istaknuti dva cilja. Prvi cilj je analizirati indeks razvijenosti informacijsko – komunikacijskih tehnologija (IDI) te indeks globalizacije (KOF Globalisation Indeks) te će se prikazati rang pojedinih europskih

¹ Brigit Susanne Lehner, Julia Jung, Brigitte Stieler-Lorenz, Anika Nitzsche, Elke Driller, Jürgen Wasem, Holger Pfaff, "Psychosocial Factors in the Information and Communication Technology Sector" *Management Decision*, Vol. 51, No 9, pp. 1878-1892, 2013.

(i svjetskih) zemalja prema odabranim indeksima kojima se mjeri razvijenost informacijsko – komunikacijskih tehnologija i indeksa globalizacije. Drugi odnosno sekundarni cilj je analizirati poziciju Republike Hrvatske s obzirom na korištenje i razvijenost informacijsko – komunikacijskih tehnologija i razine indeksa globalizacije. Isto tako kroz rad će se ispitati istraživačka hipoteza koja glasi: „Tehnološke promjene utječu na paralelan rast i viši stupanj indeksa razvijenosti informacijsko – komunikacijskih tehnologija i indeksa globalizacije“

2. TEHNOLOŠKA DINAMIKA INFORMACIJSKO – KOMUNIKACIJSKIH TEHNOLOGIJA

Suvremeno poslovanje egzistira i funkcionira na primjeni i korištenju novih digitalnih tehnologija. Digitalizacija i proces digitalne transformacije poslovanja unapređuje poslovne procese, olakšava i ubrzava dnevne operacije unutar poduzeća, povećava efikasnost i efektivnost poslovnih procesa te povećava vidljivost na tržištu. Komunikacija je pojednostavljena, brža i izravna pri čemu se ostvaruje tzv. dvosmjerna komunikacija koja je jedno od glavnih obilježja interneta i novih digitalnih tehnologija. Navedenim aktivnostima poboljšana je komunikacija putem interneta, osluškuju se i uvažavaju potrebe potrošača na puno brži i kvalitetniji način čime se može utjecati na smanjenje troškova ali i povećanje efikasnosti i efektivnosti. Digitalni proces komunikacije koji se ostvaruje putem interneta i njegovih digitalnih platformi koje egzistiraju na internetu donosi niz prednosti za organizaciju i njezino poslovanje te ima utjecaj na cijenu kreiranja, obrade, distribucije i skladištenja proizvoda, smanjuje vrijeme protoka informacija te omogućuje lakši i brži nadzor nad troškovima poslovanja. Uslijed digitalizacije i digitalne transformacije važnu ulogu u prihvaćanju i implementaciji nove tehnologije ima proces upravljanja kvalitetom. Koncept upravljanja kvalitetom očituje se u ovom segmentu kroz ostvarivanje ciljeva organizacije pri implementaciji i primjeni nove tehnologije pri čemu se osigurava i poboljšavanje kvaliteta poslovanja, a kroz upravljanje aktivnostima nužnim za provedu procesa digitalne transformacije. Proces upravljanja kvalitetom pretpostavka je i ključ opstanka, rasta i razvoja poduzeća, a u ovom kontekstu usko povezana s rastom i razvojem informacijsko – komunikacijskih tehnologija i njihovoj kvalitetnoj implementaciji i primjeni. Nove informacijsko – komunikacijske te digitalne tehnologije dostupne su poduzećima s aspekta prepoznavanja, implementacije i korištenja u poslovanju, a sve s ciljem povećanja produktivnosti poslovanja. Internet i njegovi brojni kanali i platforme omogućuju niz pogodnosti,

kako za poduzeća tako i za same potrošače i sve zainteresirane strane, što dovodi do stvaranja dugoročnih odnosa tj. dugoročnih partnerstva sa svim zainteresiranim stranama. Interaktivnost interneta i njegovih digitalnih tehnologija olakšava uvelike kreiranje prepoznatljivosti i dostupnosti poduzeća ali i njegovih proizvoda i usluga na tržištu. Daljnji napredak cjelokupnog društva ovisi ponajviše o spremnosti, inicijativi i brzini prihvatanja, implementaciji i korištenju novih tehnologija. Potrebno je dodatno investirati u infrastrukturu informacijsko – komunikacijskih tehnologija, naročito kod zemalja u razvoju kao i težiti povećanju razine informatičke pismenosti. Upravo navedeni elementi mogu smanjiti digitalni jaz koji se javlja između razvijenih zemalja i zemalja u razvoju, a što na globalnoj razini koči daljnji napredak, razvoj i korištenje informacijsko – komunikacijskih tehnologija.

Uz trenutnu procjenu svjetske populacije od 7,8 milijardi, otprilike 4,93 milijarde ljudi ima pristup internetu i često ga koristi. To znači da 63,2% svjetske populacije koristi internet. Od 2000. do 2020. godine korištenje interneta poraslo je za 1.266%. Evidentno je da upotreba i korištenje interneta svake godine raste što je naročito bilo vidljivo i izraženo uslijed pandemije COVID-19 (Tablica 1). Poduzeća su se trebala osloniti na digitalne tehnologije puno više nego što je to bio slučaj prije pandemije, Korištenje društvenih medija, video platformi, e-commerce, doživjelo je značajan porast primjene u poslovanju kako bi se osigurali uvjeti na normalan nastavak poslovanja.

Tablica 1. Broj stanovnika i korisnika interneta u svijetu u 2000. i u 2021. godini

Regija svijeta	Stanovništvo (2021-proc.)	% stanovništva svijeta	Korisnici interneta (31.03.2021)	Stopa penetracije (%)	Rast 2000.-2021.	Korisnici interneta (%)
Azija	4.327.333.821	54,9%	2.762.187.516	63,8%	2.316,5%	53,4%
Europa	835.817.920	10,6%	736.995.638	88,2%	601,3%	14,3%
Afrika	1.373.486.514	17,4%	594.008.009	43,2%	13,058%	11,5%
Latinska Amerika/Karibi	659.743.522	8,4%	498.437.116	75,6%	2.658,5%	9,6%
Sjeverna Amerika	370.332.393	4,7%	347.916.627	93,9%	221,9%	6,7%
Bliski Istok	265.587.661	3,4%	198.850.130	74,9%	5.953,6%	3,9%
Oceanija/Australija	43.473.756	0,6%	30.385.571	69,9%	298,7%	0,6%
SVIJET / UKUPNO	7.875.765.587	100,0%	5.168.780.607	65,6%	1.331,9%	100,0%

Izvor: Internet World Stats (2021)²

² <https://www.internetworldstats.com/stats.htm>

Tablica 1. prikazuje najnovije podatke vezane uz korištenje interneta. U 2021. godini prema zadnjim revidiranim i dostupni podacima, na datum 31.03.2021. broj korisnika interneta je 5.168.780.607 što čini 65,6% populacije (Internet World Stats, 2021). U zadnjih 21 godinu došlo je do povećanja od 1.331,9% korisnika u svijetu. S obzirom na ukupan broj korisnika interneta (5.168.780.607), najviše ih je u Aziji, više od polovice (53,4%) gdje je ujedno i najveći broj stanovnika u odnosu na ostatak svijeta (4.327.333.821). Nakon Azije slijedi Europa s 14,3% korisnika interneta, te Afrika s 11,5%: manji te približno jednak postotak imaju Latinska Amerika i Karibi sa 9,6%, Sjeverna Amerika sa 6,7% dok tek 0,6% otpada na Oceaniju tj Australiju. Iz vidljivog konstantnog, brzog rasta i korištenja interneta te informacijsko – komunikacijskih tehnologija razvijene su i postoje metode koje prate i mjere korištenje i razvijenost informacijsko – komunikacijskih tehnologija i njezin posljedični utjecaj na globalizaciju kao i metode i mjere koje prati rast i razvoj same globalizacije. Upravo metode i tehnike mjerenja razvoja informacijsko – komunikacijskih tehnologija kao i stupnja globalizacije prikazane su kroz naredna poglavlja.

3. POJMOVNO ODREĐENJE INDEKSA RAZVIJENOSTI INFORMACIJSKO – KOMUNIKACIJSKIH TEHNOLOGIJA (IDI) I INDEKSA GLOBALIZACIJE (KOF)

Razvijenost korištenja informacijsko – komunikacijskih tehnologija mjeri se indeksom razvijenosti informacijsko – komunikacijskih tehnologija (eng. ICT Development Indeks (IDI)).

3.1. Indeks razvijenosti informacijsko – komunikacijskih tehnologija (IDI indeks)

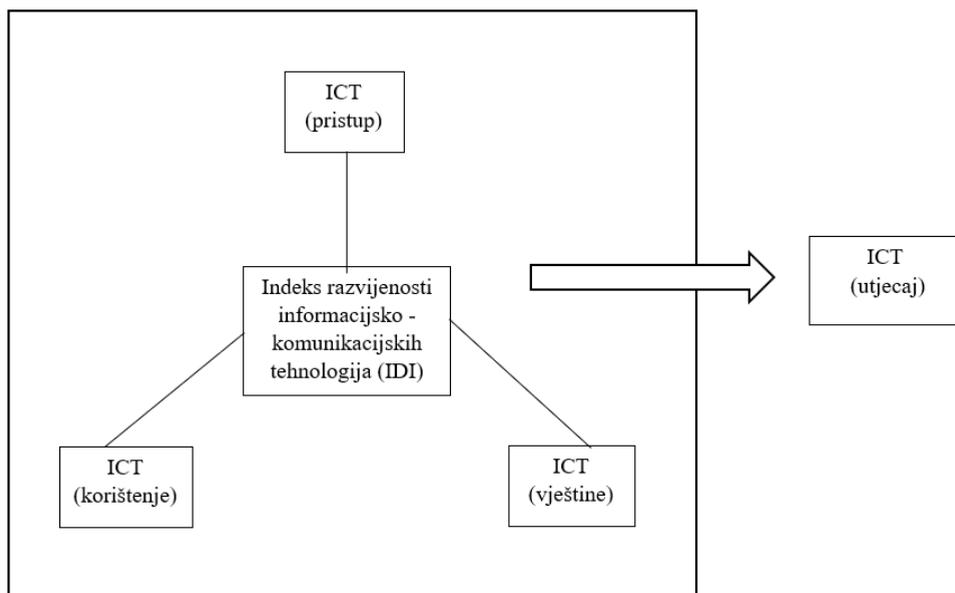
Indeks razvoja informacijsko – komunikacijskih tehnologija (IDI) je kompozitni pokazatelj (tj. skup pojedinačnih pokazatelja) koji je pokrenuo International Telecommunication Union (ITU) 2009. godine kako bi procijenio i usporedio razvoj informacija i komunikacijske tehnologije (ICT) u različitim zemljama i tijekom vremena. Trenutno zadnji dostupni podaci vezani uz Indeks razvijenosti informacijsko – komunikacijskih tehnologija objavljeni su u dokumentu „Measuring the Information Society Report 2017“³ i odno-

³ https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2017/MISR2017_Volume1.pdf

se se na 2017. godinu. Indeks razvijenosti informacijsko – komunikacijskih tehnologija sastoji se od tri podindeksa: (1) pristup informacijsko – komunikacijskim tehnologijama, (2) korištenje informacijsko – komunikacijskih tehnologija, (3) vještine korištenja informacijsko – komunikacijskih tehnologija.

Metodologija izračuna IDI indeksa od 2009. do 2017. godine temelji se na istim zakonitostima i pravilima. U izračun se uključuju indeksi i podindeksi. Podindeksi su izračunati zbrajanjem ponderiranih vrijednosti pokazatelja uključenih u odgovarajuću podskupinu.⁴ Uvjetovano ubrzanim i konstantnim tehnološkim napretkom uviđena je potreba za poboljšanjem metoda mjerenja i ažuriranja sastava IDI-a indeksa što trenutno predstavlja izazov u usklađivanju i predlaganju načina izračuna indeksa ali i rješavanja problema oko kvalitete podataka, nedostupnosti svih potrebnih podataka te konstrukcije specifičnih pokazatelja.

Slika 1. Komponente indeksa razvoja informacijsko – komunikacijskih tehnologija (IDI indeks)



Izvor: Measuring the Information Society Report 2017. (Volume 1)⁵

⁴ ITU, 2017.

⁵ https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2017/MISR2017_Volume1.pdf

Svaki od tri navedena podindeksa sadržava 11 pokazatelja (Tablica 1). Izbor pokazatelja kroz tri podindeksa reflektira svojevrsnu fazu transformacije u tzv. informacijsko društvo. Pokazatelji u svakom podindeksu mogu se i trebali bi se revidirati kako bi odražavali promjene u tehnologiji i tržištima tijekom vremena, te poboljšanja u dostupnosti i kvaliteti podataka, čime se zajedno utječu na kvalitetu poslovanja.

3.2. Globalizacija i indeks globalizacije (KOF Indeks)

Globalizacija je povećanje međunarodne razmjene na tržištima dobara, usluga i tržištu nekih faktora proizvodnje, uključujući rast i razvoj institucija koje premošćuju nacionalne granice – poduzeća, vlade, međunarodne institucije i nevladine udruge.⁶ U današnjem modernom društvu globalizacija postaje sve kompleksniji proces. Globalizacijski indeks po mjerenju može biti de facto ili de jure. De facto mjere uključuju varijable koje predstavljaju stvarne tokove i aktivnosti, dok de jure mjere obuhvaćaju varijable koje predstavljaju politiku, resurse i/ili institucije koje omogućuju, odnosno olakšavaju stvarne tokove i aktivnosti. Ukupni globalizacijski indeks dobiva se kao kombinacija de facto i de jure mjerenja. Kako bi se globalizacija mogla točnije definirati i izmjeriti globalizaciju se dijeli na tri dimenzije:⁷ ekonomsku, socijalnu i političku. Uvjetovano brzim razvojem globalizacije revidiran je indeks koji razlikuje de facto i de jure mjere duž različitih dimenzija globalizacije, temelji se na 43 umjesto 23 varijable u prethodnoj verziji, revidirani indeks razdvaja trgovinsku i financijsku globalizaciju unutar ekonomske dimenzije globalizacije te koristi vremenski promjenjivo ponderiranje varijabli.⁸ Kako bi se moglo razumjeti dimenzije globalizacije, nužno ih je objasniti. Ekonomska dimenzija se dijeli na trgovinsku i financijsku globalizaciju, koja prema spomenutoj reviziji indeksa razdvaja spomenute dimenzije. Razdvajanje ovih dviju dimenzija uvjetovano je kroz samu srž dimenzija, a to je da se trgovinska globalizacija odnosi na slobodu kretanja roba i usluga među državama i uklanjanje prepreka trgovini robom i uslugama, dok se financijska globalizacija odnosi na kretanja kapitala i investicija među zemljama. Socijalna globalizacija obuhvaća tri poddimenzije: interpersonalna globalizacija,

⁶ Alan V. Deardorff, Robert M. Stern, "What You Should Know about Globalization and the World Trade Organization", *Review of International Economics*, Vol. 10, No. 3), 2001, pp. 403-427.

⁷ Savina Gygli, Haelg Florian, Potrafke Niklas, Jan-Egbert Sturm, "The KOF Globalization Index – Revisited", *Review of International Organizations*, Vol. 14, No. 3, 2019, pp. 543-574. <https://doi.org/10.1007/s11558-019-09344-2>

⁸ Ibid.

informatijska globalizacija i kulturna globalizacija dok se politička globalizacija odnosi na prihvaćanje stranih državljana i stranih ideja ali i spremnost zemlje da surađuje s drugim zemljama i da proširuje partnerstva i sporazume. Sve navedene dimenzije sastavni su dio indeksa globalizacije i predstavljaju ključne element koji definiraju globalizaciju. Globalizacija stvara industrijsku kompetentnost, utječe na ekonomiju obujma zbog širenja tržišta, stvara i utječe na razvoj iskorištenja resursa te dovodi do bržeg tehnološkog razvoja.

4. ANALIZA INDEKSA RAZVIJENOSTI INFORMATIJSKO – KOMUNIKACIJSKIH TEHNOLOGIJA (IDI INDEKS)

Promatranjem i analizom IDI indeksa vidljivo je da i dalje postoji jaz između razvijenih zemalja i zemalja u razvoju s aspekta stupnja razvijenosti informatijsko – komunikacijskih tehnologija.

4.1. Analiza rezultata indeksa razvijenosti informatijsko - komunikacijskih tehnologija za 2017. godinu na razini Svijeta i Europske unije

Iako su vidljivi pomaci i ulaganje u infrastrukturu i inovacije, zemlje u razvoju kasne za razvijenim zemljama i ostvaruju tek minimalne pomake. Vrijednosti indeksa IDI u 2017. godini pokazuju najvišu poziciju za Island (8,98). U top deset najbolje rangiranih zemalja nakon Islanda spadaju Republika Korea (8,85), Švicarska (8,74), Danska (8,71), Ujedinjeno Kraljevstvo (8,65), Hong Kong – Kina (8,61), Nizozemska (8,49), Norveška (8,47), Luxemburg (8,47) i Japan. Prema iznesenim podacima može se vidjeti da čak sedam zemalja pripada Europi (Island, Švicarska, Danska, Ujedinjeno Kraljevstvo, Nizozemska, Norveška, Luxemburg), dok su ostale tri zemlje iz Azije (Republika Korea, Hong Kong – Kina, Japan). Vidljivo je da visoka mjesta zauzimaju visoko razvijene zemlje s visokim stupnjem razvoja IDI indeksa što je rezultat visokog stupnja inovacija i tehnološke infrastrukture u spomenutim zemljama. Osim visoko razvijenih postoje i zemlje koje su tehnološki nerazvijene, s nedovoljno ulaganja u infrastrukturu i nedovoljno inovacija pa zauzimaju zadnjih deset mjesta (Burkina Faso, Ekvatorijalna Gvineja, Komori, Tanzanija, Gvineja, Malavi, Haiti, Madagaskar, Etiopija, Kongo, Burundi, Gvineja Bisau, Čad, Srednjoafrička Republika, Eritreja). U odnosu na IDI 2016. godine, najveći pomak imala je država Uzbekistan, i to pomak za 8 mjesta (sa 103. mjesta pomakla se na 95. mjesto), za 6 mjesta pomakle su se sljedeće države: Afganistan, Hrvatska, Surinam, Uganda i Urugvaj. Republika Hrvatska se s ranga 42 u 2016.

godini pomakla na rang 36 u 2017. godini, što govori o napretku na području informatizacije, inovacija i ulaganja u tehnološku infrastrukturu. Uspoređujući indeks razvijenosti informacijsko – komunikacijskih tehnologija zemalja Europske unije (EU) i susjednih država Republike Hrvatske, može se primijetiti da je prema stupnju razvijenosti IDI-a indeksa bolja jedino Slovenija. Slovenija zauzima 33. mjesto od 176 zemalja svijeta odnosno uspoređujući zemlje Europske unije nalazi se na 22. mjestu od ukupno 40 zemalja, dok Republika Hrvatska zauzima 24. mjesto od ukupno 40 zemalja EU. Srbija, Bosna i Hercegovina, Mađarska, Italija i Crna Gora nalaze se iza Republike Hrvatske prema stupnju razvijenosti IDI-a indeksa.

Dvije godine zaredom najviše pozicije zadržavaju iste zemlje, Island, Švicarska, Danska, Ujedinjeno Kraljevstvo, dok Hrvatska ostvaruje pomak. Tablica 2. prikazuje kretanje IDI indeksa za razdoblje 2016. i 2017. godine za vodeće zemlje EU prema stupnju razvijenosti IDI indeksa.

Tablica 2. Prikaz položaja vodećih zemalja EU prema indeksu razvijenosti informacijsko – komunikacijskih tehnologija u 2016. i 2017. godini

	IDI 2017. Rang	Država	IDI 2017. Vrijednost	IDI 2016. Rang	IDI 2016. Vrijednost	Promjena ranga (+/-)
1	1	Island	8,98	2	8,7	+
2	3	Švicarska	8,74	4	8,66	+
3	4	Danska	8,71	3	8,68	-
4	5	Ujedinjeno Kraljevstvo	8,65	5	8,53	0
5	7	Nizozemska	8,49	10	8,40	+
6	8	Norveška	8,47	7	8,45	-
7	9	Luksemburg	8,47	9	8,40	0
8	11	Švedska	8,41	8	8,41	-
9	12	Njemačka	8,39	13	8,20	+
10	15	Francuska	8,24	17	8,5	+
24	36	Hrvatska*	7,24	42	6,96	+

Izvor: International Telecommunication Union (ITU), 2018.⁹

*Republika Hrvatska ne spada u vodeće zemlje ali radi prikaza uzeta je u obzir. Visoko razvijene zemlje pokazuju i visoki stupanj tehnološkog razvoja dok Republika Hrvatska kasni za visoko razvijenim zemljama no ipak ostvaruje bolje rezultate od pojedinih zemalja u okruženju. Cilj indeksa razvijenosti informacijsko - komunikacijskih tehnologija je upravo smanjivanje jaza između razvijenih zemalja i zemalja u razvoju pri čemu se i dalje trebaju ulagati veliki naponi kako bi se isto i ostvarilo te kako bi stupanj razvoja informacijsko - komunikacijskih tehnologija mogao i dalje biti pokretač gospodarsko – društvenog razvoja zemalja.

⁹ <https://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx>

Prema zadnjim, dostupnim i relevantnim podacima iz 2017. godine Republika Hrvatska ima jednu od najvećih stopa ICT penetracije u odnosu na ostale balkanske zemlje te je oko europskog prosjeka.

4.2. Indeks razvijenosti informacijsko - komunikacijskih tehnologija za Republiku Hrvatsku za 2017. godinu.

Prema podacima ITU (2018) vidljiva su kontinuirana ulaganja u infrastrukturu uz potrebu za povećanim ulaganjem u ultrabrzi širokopojasni internet kako bi se i dalje zadržala pogodna pozicija i povoljna razvijenost IDI-a indeksa. Prema podacima ITU (2018) mobilni i fiksni operateri su u Republici Hrvatsku uložili oko 400 milijuna USD u 2017., što predstavlja povećanje od oko 5 posto u odnosu na 2016. Za ICT kućanstva penetracija je relativno visoka i broj ljudi koji koriste internet raste (ITU, 2018). Top pet zemalja u 2017. prema razini razvijenosti IDI-a indeksa su: Irska, Koreja, Švicarska Danska i Ujedinjeno Kraljevstvo. Prema podacima indeksa razvijenosti informacijsko – komunikacijskih tehnologija za 2017. godinu Hrvatska zauzima 36. poziciju u odnosu na 176 zemalja te ostvaruje vrijednost indeksa od 7,24 u odnosu na najvišu vrijednost 8,98 (Irska). Hrvatska za podindeks „Pristup“ ostvaruje 39. mjesto i vrijednost indeksa 7,60 u odnosu na najvišu vrijednost 9,54 (Luksemburg). Za podindeks „Korištenje“ Hrvatska ostvaruje 41. mjesto i vrijednost indeksa 6,45 u odnosu na najvišu vrijednost 8,94 (Danska), dok za podindeks „Vještine“ ostvaruje 38. mjesto i vrijednost indeksa 8,11 u odnosu na najvišu vrijednost 9,28 (Australija) (Tablica 3).

Tablica 3. Prikaz položaja Republike Hrvatske prema indeksu razvijenosti informacijsko – komunikacijskih tehnologija u 2017. godini

Indeks/podindeks	Rang Republika Hrvatska *	Vrijednost podindeksa
Indeks razvijenosti IDI 2017	36/176	7,24
Podindeks Pristup	39/176	7,60
Podindeks Korištenje	41/176	6,45
Podindeks Vještine	38/176	8,11

Izvor: International Telecommunication Union (ITU) (2018)¹⁰

*prikazan je podatak o rangui Republike Hrvatske u odnosu na ukupan broj promatranih zemalja.

¹⁰ <https://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx>

Rezultati indeksa razvijenosti informacijsko – komunikacijskih tehnologija ukazuju da Republika Hrvatska ne iskorištava u potpunosti tj. ne primjenjuje u potpunosti informacijsko – komunikacijske tehnologije. Svi razmatrani pokazatelji nisu na zadovoljavajućoj razini te je nužno usmjeravanje za postizanje više pozicije. Republika Hrvatska prije svega ima dosta prilika i mogućnosti za daljnji rast i napredak u spomenutim područjima podindeksa kako bi se postigla zadovoljavajuća razina razvijenosti IDI-a indeksa.

5. ANALIZA I MJERENJE GLOBALIZACIJE

Kako je kroz prethodna poglavlja objašnjen pojam globalizaciju, nužno je vidjeti način na koji se ista može mjeriti. Globalizacija ima učinak na cjelokupno stanovništvo jedne države pa i na samu državu. Može se tvrditi da je globalizaciju isto tako teško izmjeriti zbog brojnih aspekta i faktora od kojih se sastoji ali i njezine kompleksnosti. Postoje Maastricht Globalization Indeks – MGI¹¹ i KOF Globalization Indeks¹² pomoću kojih se mjeri razina i stupanj globalizacije. Između navedena dva indeksa postoje razlike. MGI indeks ima sljedeće dimenzije: politička, ekonomska, sociološka, tehnološka i ekološka, dok KOF uključuje veći broj pokazatelja i tri bitne dimenzije (ekonomska, sociološka i politička) te su podaci koji se koriste za KOF indeks lakše dostupni i češće ažurirani (Tablica 4). Indeks globalizacije KOF je vjerojatno najpopularniji indeks globalizacije. Obuhvaća veliki skup podataka panela koji uključuje 203 zemlje i teritorija te se proteže od 1970. godine. Podaci su lako dostupni i godišnje ažuriranje povećava njihov vremenski raspon.¹³ Indeksi globalizacije razlikuju se po fokusu mjerenja kao što su de facto globalizacija ili globalizacijske politike i uvjeti, koji se također nazivaju de jure mjere. Dok de facto globalizacija mjeri stvarne tokove i aktivnosti, de jure globalizacija mjeri politike, resurse, uvjete i institucije koje u načelu omogućuju ili olakšavaju stvarne tokove i aktivnosti. Većina globalizacijskih indeksa usredotočena je na de facto globalizaciju.¹⁴ De facto način mjerenja globalizacije predstavlja robnu razmjenu između država dok de jure način

¹¹ Pim Martens, Marco Caselli, Philippe De Lombaerde, Lukas Figge, Jan Aart Scholte, “New directions in globalization indices”, *Globalizations*, (August): 1–12, 2015.

¹² Axel Dreher, “Does Globalization Affect Growth?”, University of Mannheim Working Paper, 2003, <http://dx.doi.org/10.2139/ssrn.348860>

¹³ Savina Gygli, Haelg Florian, Potrafke Niklas, Jan-Egbert Sturm, “The KOF Globalization Index – Revisited”, *Review of International Organizations*, Vol. 14, No. 3, 2019, pp. 543-574. <https://doi.org/10.1007/s11558-019-09344-2>

¹⁴ Ibid.

mjerenja globalizacije predstavlja proces otežanja ili sprečavanja robne razmjene među zemljama. Indeks globalizacije fokusira se i mjeri globalizaciju na nacionalnoj razini. Ovakav način mjerenja globalizacije izostavlja sve transakcije unutar zemlje i često zanemaruje geografsku distribuciju veza.¹⁵ Uz izvjesne nedostatke predloženi su i razvijeni indeksi koji isključuju državu i mjere: Indeks globalizacije na temelju osoba (PBGI)¹⁶ i Globalni indeks gradova (GCI).¹⁷ Navedeni indeksi pružaju nove dimenzije te novi pristup i koncept globalizaciji, no ipak nacionalne vlade ostaju glavni akteri u oblikovanju procesa globalizacije.

KOF se sastoji od ekonomske, društvene i političke dimenzije globalizacije. Predlaže se dodatak KOF indeksu, a prema Maastrichtskom indeksu globalizacije i to u segmentu tehnološke i ekonomske komponenta. No, ipak može se tvrditi da se tehnološka komponenta preklapa s društvenom komponentom KOF-a dok je ekološka dimenzija posebna značajka Maastrichtskog indeksa globalizacije. Kulturna globalizacija kao dio društvene globalizacije najteža je dimenzija za shvatiti pa se stoga u revidiranom KOF-u predlaže šira definicija kulturne globalizacije i uključivanje dodatne varijable. Kako bi KOF indeks prikupljao sve bitne varijable pri ocjenjivanju globalizacije teži se njegovom ažuriranju na godišnjoj razini pa su stoga potrebne varijable koje će se redovito ažurirati i objavljivati. Elementi ažuriranja KOF indeksa primjenjuju pravilo da niti jedna varijabla ne dominira nad jednom određenom poddimenzijom, pa su stoga za svaku poddimenziju potrebne najmanje tri varijable. Razlikovanje između de facto i de jure globalizacije u svakoj poddimenziji (trgovinskoj, financijskoj, međuljudskoj, informacijskoj, kulturnoj i političkoj) zahtijeva minimalni skup od 36 varijabli. Globalizacija i njezin utjecaj na gospodarski rast su neupitni i svakako usko povezani, doprinose razmjeni znanja, kapitala i tehnologije te stvaraju nova partnerstva.

5.1. Analiza rezultata indeksa globalizacije (KOF) za razdoblje 2012. - 2021. godine

Globalizacija predstavlja neometan protok roba, usluga, kapitala, ljudi što doprinosi stupnju gospodarske razvijenosti i stvaranju jedinstvene svjetske zajednice. Slobodno i neometano kretanje kao vrlo kompleksan proces tržišta stvara niz promjena u cijelom svijetu, dovodi do niza promjena i nači-

¹⁵ Pim Martens, Marco Caselli, Philippe De Lombaerde, Lukas Figge, Jan Aart Scholte, "New directions in globalization indices", *Globalizations*, (August): 1–12, 2015.

¹⁶ Marco Caselli, "Nation states, cities, and people", *SAGE Open*, Vol. 3, No. 4, 2013.

¹⁷ A.T. Kearney, "Global Cities Report" Chicago", 2018.

na funkcioniranje cjelokupne zajednice. Upravo globalizacija dovodi do ubrzanog i konstantnog rasta i razvoja tehnologije stvarajući na taj način nova pravila poslovanja i kreirajući nove poslovne politike. Globalizacija stvara i kreira odnose među ljudima i državama, stvara globalno razmišljanje i na taj način upravo potiče i intenzivira ulaganje u razvoj znanja i tehnologije čime doprinosi i kvaliteti poslovanja. Globalizacijski proces potiče gospodarski rast i razvoj, stvara i promovira tehnološki napredak te omogućuje širenje tržišta na globalnu razinu kreirajući napredak i prosperitet društva i države.

Proces globalizacije danas nije moguće izbjeći i nije izbor jer globalizacija predstavlja tzv. "model" koji obuhvaća cijeli svijet i proces je ekonomskog, društvenog, kulturnog i političkog djelovanja. Promatrajući indeks globalizacije i njegove vrijednosti u 2021. godini najviši stupanj globalizacije ima Nizozemska (90,91). U top deset zemalja svijeta najbolje rangiranih nakon Nizozemske spadaju, Švicarska (90,45), Belgija (90,33), Švedska (89,44), Ujedinjeno Kraljevstvo (89,31), Njemačka (88,73), Austrija (88,61), Danska (87,80), Finska (87,63) i Francuska (87,63). Rang 2020. za top 10 zemalja je isti, osim što u 2020. godini prvo mjesto zauzima Švicarska s (90,79), a drugu mjesto Nizozemska (90,68). U 2021. godini Republika Hrvatska zauzima 27. mjesto (81,49) u ukupnom rangu dok 2020. godine zauzima 29. mjesto (81,19), što prikazuje sve viši stupanj globalizacije iz godine u godinu. Prema iznesenim podacima vidljivo je da sve zemlje pripadaju području Europe što govori o visokom stupnju globalizacije europskog područja. Tablica 4. prikazuje kretanje indeksa globalizacije (KOF) za razdoblje od 2012. do 2021. godine za top deset zemalja.

Tablica 4. Kretanje KOF indeksa za razdoblje 2012 – 2021. godine za top 10 zemalja

Zemlja	UKUPAN KOF – RANG I VRIJEDNOST (TOP 10)									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Nizozemska	3 (90.94)	3 (91.33)	3 (91.33)	2 (91.24)	1 (91.70)	1 (92.84)	2 (90.24)	2 (90.71)	2 (90.68)	1 (90.91)
Švicarska	10 (86.64)	10 (86.28)	**	9 (86.04)	5 (87.01)	5 (88.79)	3 (89.70)	1 (91.19)	1 (90.79)	2 (90.45)
Belgija	1 (92.76)	1 (92.30)	2 (91.61)	3 (91.00)	3 (90.51)	3 (91.75)	1 (90.47)	3 (90.59)	3 (90.46)	3 (90.33)
Švedska	6 (88.23)	7 (87.63)	7 (87.39)	6 (86.59)	8 (85.92)	7 (87.96)	4 (88.05)	4 (89.93)	4 (89.44)	4 (89.44)
Ujedinjeno Kraljevstvo	**	**	**	**	**	8 (87.26)	8 (87.23)	5 (89.84)	5 (89.39)	5 (89.31)
Njemačka	**	**	**	**	**	**	9 (86.89)	7 (88.60)	6 (88.83)	6 (88.73)
Austrija	4 (90.55)	4 (89.48)	4 (90.48)	4 (90.24)	4 (89.83)	4 (90.05)	5 (87.91)	6 (88.85)	7(88.56)	7 (88.61)
Danska	7 (88.11)	6 (88.12)	6 (87.43)	7 (86.30)	7 (86.44)	6 (88.37)	6 (87.85)	8 (88.26)	8 (87.96)	8 (87.80)
Finska	-	-	10 (85.87)	10 (85.64)	-	-	10 (85.98)	9 (87.70)	9 (87.70)	9 (87.68)
Francuska	-	-	-	-	-	9 (87.19)	7 (87.34)	10 (87.25)	10 (87.69)	10 (87.63)
Irska	2 (91.95)	2 (91.79)	1 (92.17)	1 (91.30)	2 (91.64)	2 (92.15)	**	**	**	**
Singapur	5 (89.18)	5 (88.89)	5 (88.63)	5 (87.49)	6 (86.93)	**	**	**	**	**
Mađarska	8 (87.38)	9 (86.85)	9 (85.91)	-	9 (85.78)	10 (86.55)	**	**	**	**
Portugal	9 (86.73)	8 (87.07)	8 (87.01)	8 (86.29)	**	**	**	**	**	**
Kanada	**	**	**	**	10 (85.67)	**	**	**	**	**
Hrvatska*	32 (75.88)	33 (75.36)	33 (74.92)	32 (75.69)	35 (75.59)	24 (81.39)	29 (79.04)	27 (81.42)	29 (81.19)	27 (81.49)

Izvor: KOF Swiss Economic Institute

<https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html>

*Republika Hrvatska ne spada u top 10 zemalja ali radi prikaza uzeta je u obzir.

** Navedene države u tom razdoblju nisu bile u top 10 zemalja.

Iz tablice 4. vidljivo je da u razdoblju od 2012. – 2021. godine top deset zemalja po stupnju globalizacije zauzimaju zemlje iz Europe, dok se u top deset zemalja u spomenutom razdoblju javljaju Singapur i Kanada koje ne pripadaju području Europe. Nizozemska u promatranom razdoblju konstantno drži jedno od prvih tri mjesta zajedno s Belgijom. Irska u razdoblju 2012. – 2017. godine drži jedno od prvih dva mjesta po stupnju KOF-a dok 2018. pada ispod desetog mjesta. Švicarska bilježi skok u 2018. godini na treće mjesto da bi u 2019. i 2020. godini bila na prvom mjestu, a 2021. na drugom. Republika Hrvatska bilježi pozitivan trend i stupanj KOF indeksa kroz promatrano raz-

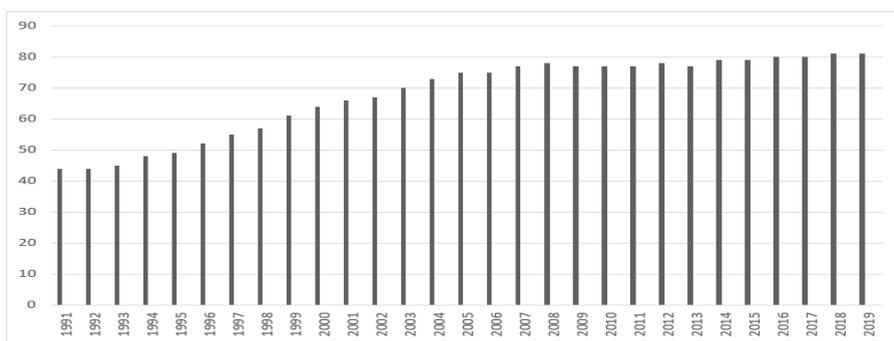
doblje gdje je 2012. godine bila na 32. mjestu (75,88) da bi 2021. zauzela 27. mjesto (81,49). Ionako nije pozicionirana visoko Republika Hrvatska bilježi napredak i polako postaje sve više globalizirana.

5.2. Indeks globalizacije (KOF) za Republiku Hrvatsku

Globalizacija dovodi do napretka tehnologije, a koji rezultira povećanjem konkurentnosti svjetskom tržištu. Zemlje u razvoju, zemlje u tranziciji i nisko razvijene zemlje zbog procesa globalizacije mogu preuzimati znanja i tehnologiju (tehnološke procese) visoko razvijenih zemalja što će im omogućiti postepeni i brži gospodarski rast i razvoj.

U svijetu ne postoji niti jedna zemlja koja je otporna na proces globalizacije. Štoviše sve zemlje svijeta zahvaćene su procesom globalizacije i trebaju znati prilagoditi se te proces globalizacije prihvatiti kako bi mogle globalno konkurirati. Stoga se niti Republika Hrvatska ne može oduprijeti širenju globalizacijskog procesa. Republici Hrvatskoj kao zemlji koje je bila zahvaćena ratom, globalizacija i praćenje trendova globalizacije bili su izrazito otežani. No, promatrajući danas rast i razvoj Republike Hrvatske i stavljajući je u kontekst globalizacije, moguće je govoriti o postepenom rastu globalizacijskog indeksa koji govori o rastu i razvoju Republike Hrvatske kako na nacionalnoj razini tako i na svjetskoj. Upravo je i trend globalizacije prikazan kroz grafikon 1. koji prikazuje prisutnost globalizacije u Republici Hrvatskoj.

Grafikon 1. Kretanje KOF globalizacijskog indeksa u Republici Hrvatskoj u razdoblju od 1991. do 2019.godine



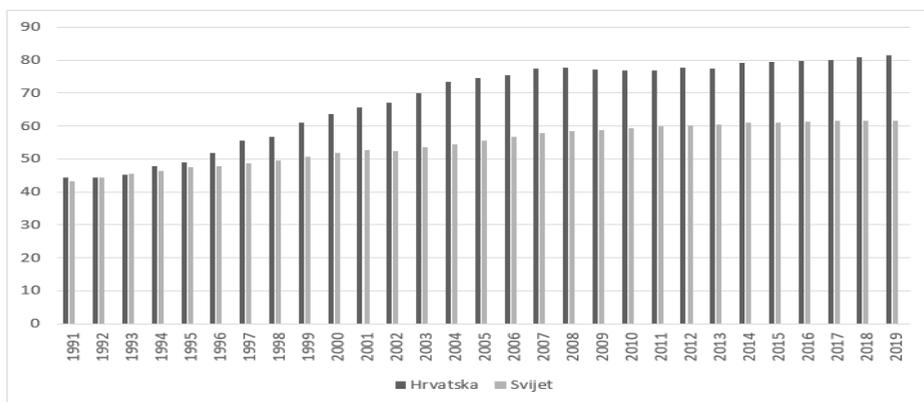
Izvor: KOF Swiss Economic Institute¹⁸

¹⁸ <https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html>

Na grafikonu 1. vidljivo je kako se globaliziranost Republike Hrvatske godinama kontinuirano povećava. Počevši od 1991. godine KOF globalizacijski indeks Republike Hrvatske iznosio je 43,19 dok je 2019. godine porastao na 81,49. Strategije i politike jedne države pa tako i Republike Hrvatske trebaju se prilagoditi izazovima globalizacije te trebaju biti spremne reagirati i odgovoriti na izazove koje globalizacija donosi. Ulaskom u EU Republika Hrvatska pokazuje rast i razvoj na mnogim područjima pa tako i vezano uz proces globalizacije čime potiče razvoj inovacija, znanja i novih tehnologija te doprinosi kvaliteti poslovanja kako samih poduzeća tako i cjelokupnog gospodarstva. Kako bi se pratio trend rasta globalizacije na razini Republike Hrvatske a u odnosu na svjetsku globalizaciju, grafikon 2. pokazuje usporedbu Republike Hrvatske i svijeta u razdoblju od 1991 – 2019. godine.

Grafikon 2. jasno prikazuje pozitivan i konstantan trend rasta KOF indeksa Republike Hrvatske a koji je konstantno veći od prosječnog KOF indeksa u svijetu. Viša razina KOF indeksa globalizacije govori o tome da Republika Hrvatska iz godine u godinu sve više globalizira i sudjeluje u procesu globalizacije povećavajući svoju ekonomsku, sociološku i političku dimenziju.

Grafikon 2. Usporedba KOF globalizacijskog indeksa Hrvatske i svijeta



Izvor: KOF Swiss Economic Institute¹⁹

¹⁹ <https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html>

Upravo rast te viši koeficijent od svjetske razine govori o pozitivnim utjecajima na otvorenost gospodarstva, slobodnu razmjenu dobara, znanja, kapitala i tehnologije.

6. POVEZANOST INDEKSA RAZVIJENOSTI INFORMACIJSKO – KOMUNIKACIJSKE TEHNOLOGIJE (IDI) I INDEKSA GLOBALIZACIJE (KOF) – KRITIČKI OSVRT I PREPORUKE ZA DALJNJA ISTRAŽIVANJA

Nakon objašnjenja nove informacijsko – komunikacijske i digitalne tehnologije te njihove prednosti koji pružaju organizacijama, a s njima i povezan razvoj indeksa informacijsko – komunikacijskih tehnologija te KOF indeksa može se govoriti o povezanosti tehnologije i globalizacije. Kroz ovaj rad prikazana su dva indeksa, indeks razvijenosti informacijsko – komunikacijskih tehnologija (IDI) te indeks globalizacije (KOF). Analizirani su podaci za 2017. godinu vezani uz indeks razvijenosti informacijsko – komunikacijskih tehnologija (IDI) kao trenutno zadnje dostupni podaci vezani uz spomenuti indeks, dok indeks globalizacije kroz rad prikazuje trend kretanja od 1991 – 2019. godine. Podaci za oba indeksa pokazuju trend kretanja za Republiku Hrvatsku, zemlje EU i svijeta. Temeljem podataka koji pokazuje indeks razvijenosti informacijsko – komunikacijskih tehnologija (IDI) kod deset vodećih zemalja od kojih su neke Island, Švicarska, Danska, Ujedinjeno Kraljevstvo, Nizozemska, Norveška, Švicarska, koje zadržavaju vodeće pozicije već nekoliko godina. Visoka razina razvijenosti indeksa informacijsko – komunikacijskih tehnologija u navedenim zemljama govori o visokom stupnju tehnološkog razvoja, ulaganju u tehnološku infrastrukturu, ali i velikom broju inovacija, širenju znanja i kretanju kapitala. Zanimljivo je da se sve vodeće zemlje po pitanju razvoja indeksa informacijsko – komunikacijskih tehnologija nalaze na području Europe što opet potvrđuje činjenicu o visokom stupnju tehnološkog razvoja na području EU. Uz indeks informacijsko – komunikacijskih tehnologija (IDI) kroz rad je istraživani indeks globalizacije (KOF). KOF indeks praćen isto tako razvojem tehnologije i pretvaranjem svijeta u jedno zajedničko tržište koje stvara i olakšava slobodan protok roba, usluga, znanja, kapitala i ljudi.

Analizirani indeks KOF kroz promatrano razdoblje prikazuje, kao i indeks IDI, visok stupanj globalizacije na području EU. U tri godine (2019., 2020., 2021. godina) u top deset zemalja svijeta prema stupnju KOF indeksa spadaju Nizozemska, Švicarska, Belgija, Švedska, Ujedinjeno Kraljevstvo,

Njemačka, Austrija, Danska, Finska, i Francuska. Gotovo iste zemlje, i kod IDI indeksa pa tako i kod KOF indeksa, zauzimaju vodećih deset mjesta. Tako Nizozemska, Norveška, Švicarska, Danska, Ujedinjeno Kraljevstvo i dr. imaju visok stupanj IDI indeksa i visok stupanj indeksa globalizacije (KOF).

Temeljem rezultata istraživanja može se govoriti o povezanosti IDI i KOF indeksa. Provedeno istraživanje potvrđuje povezanost oba indeksa odnosno govori o uskoj povezanosti tehnološkog napretka, pri čemu visok stupanj razvijenosti informacijsko – komunikacijskih tehnologija prati i visok stupanj globalizacije što prikazuje sam KOF indeks. Stoga se može potvrditi postavljenu istraživačku hipotezu da su tehnološki rast i tehnološke promjene vidljive kroz paralelni tj. istovremeni rast indeksa razvijenosti informacijsko – komunikacijskih tehnologija (IDI) i indeksa globalizacije (KOF).

Ovaj rad daje pregled IDI i KOF indeksa kroz promatrano razdoblje temeljem dostupnih podataka. Analizirani su i uspoređivani podaci kako na razini svijeta tako i na razni EU. Isto tako podaci vezani uz Republiku Hrvatsku za oba indeksa su dani. Na razni Republike Hrvatske ne postoji veliki broj istraživanja koji se bavi ovom tematikom. Tematika ovog područja kroz ovaj rad i pregledom analiziranih podataka podloga je za proširivanje istog istraživanja i još dublje analize i poveznice između indeksa razvijenosti informacijsko – komunikacijskih tehnologija i indeksa globalizacije. U ovom radu nisu spomenuti i obrađivani ostali indeksi globalizacije, a to su tzv. Maastricht Globalisation Indeks – MGI, The World Market Research Centre G-Indeks (bazira se na podacima iz ekonomskih znanosti (90%) i na tehnologiji (10%)), i A.T. Kearney/Foreign Policy Magazine Globalisation Indeks (analizira i rastavlja faktore koji guraju globalizaciju na osnovne komponente). Isto tako u radu nisu obrađivani ostali indeksi vezani uz ICT tehnologiju, a to su indeks mrežne spremnosti i indeks digitalne ekonomije i društva. Stoga preporuke za daljnja istraživanja su u pravcu objedinjava svih navedenih indeksa, njihova analiza i povezanost. Ovo područje istraživanja treba više empirijskih dokaza, teoretskih i kvantitativnih dokaza te predstavlja prostor za mnoga daljnja istraživanja.

7. ZAKLJUČAK

Tehnološke promjene stvaraju niz konstantnih promjena na tržištu. Tržišta pak zbog globalizacije postaju otvorena i slobodna te omogućavaju slobodan i brzi protok roba, usluga, znanja, inovacija i tehnologije, pa je upravo i globalizacija jedna od posljedica razvoja suvremene tehnologije, znanosti i

tržišne ekonomije. Upravo da bi se pratio stupanj tehnološkog napretka određene države, ali i njezin stupanj globalizacije razvili su se i postoje indeksi koji ta kretanja prate: stupanj razvijenosti informacijsko – komunikacijskih tehnologija (IDI indeks) i indeks globalizacije (KOF). Rad prikazuje rezultate analize spomenutih indeksa, prikazuje njihov trend kretanja kroz promatrano razdoblje i za odabrane zemlje. Nezamislivo je danas poslovati bez novih i suvremenih tehnologija koje uvjetuju daljnji rast i razvoj poduzeća ali i države. Upravo visoko razvijene zemlje imaju visok stupanj razvijenosti indeksa informacijsko – komunikacijskih tehnologija i indeksa globalizacije što potvrđuje činjenicu o važnosti nove tehnologije, njezinoj implementaciji i primjeni u poslovanju koja uvjetuje rast i razvoj poduzeća, a u konačnici i države te doprinosi kvaliteti poslovanja.

Abstract:

THE IMPACT OF TECHNOLOGICAL CHANGES ON
BUSINESS QUALITY AND GLOBALIZATION

Technological progress and the constant and rapid development of new information and communication technologies creates many changes in the market but also in the managerial management of the organization. Globalization as well as technology develop over time and cover more and more aspects of human life, but above all they affect the business environment. Globalization and the constant growth and development of new technologies have encouraged markets and all their participants to become interactive, recognizable, flexible, innovative and faster, and to better participate in the exchange of new knowledge and technologies. In addition to the fact that new technologies have a positive impact on society as a whole and socio-economic progress, they participate and contribute to creating competitive advantages on a national and global level and contribute to the quality of business. The aim of this paper is: (1) to analyse the ICT Development Index (IDI); (2) to analyse the Globalization Index (KOF Globalization Index); (3) to analyse the correlation of the observed index and to rate the position of the Republic of Croatia according to mentioned index.

Key words: technology, technological progress, information and communication technologies, digital technologies, ICT Development Index (IDI), Globalization Index (KOF Globalization Index), Republic of Croatia.

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PRIMJENA METODE ANALIZE UTJECAJA I POSljedICA POGREŠAKA NA PRIMJERU POŠTANSKIH I KURIRSKIH DJELATNOSTI

APPLICATION OF THE FAILURE MODE AND EFFECTS ANALYSIS
– CASE STUDY OF POSTAL AND COURIER SERVICES

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SAŽETAK

U radu se, primjenom metode analize utjecaja i posljedica pogrešaka (FMEA metode), istražuje mogućnost unapređenja kvalitete na primjeru poduzeća iz djelatnosti poštanskih i kurirskih djelatnosti. Suvremene tehnike i pristupi upravljanju kvalitetom stavljaju veliki naglasak na upravljanju rizicima te se primjena FMEA metode nameće kao najbolji izbor. Svrha rada je istražiti potencijale i učinke primjene FMEA metode na konkretnom primjeru kroz primjenu metode studije slučaja. Procedura primjene metode je uključila dubinsku analizu poslovnih procesa poduzeća, odabir prioritetnih područja djelovanja, formiranje timova za provedbu analize, implementaciju procedura analize utjecaja i posljedica pogrešaka i provedbu korektivnih aktivnosti kako bi se smanjili poslovni rizici. Rezultati istraživanja su pokazali da se primjenom FMEA metode mogu ostvariti značajna poboljšanja kvalitete uz istovremeno smanjenje poslovnih rizika.

Ključne riječi: upravljanje kvalitetom, FMEA metoda, upravljanje rizicima, unapređenje kvalitete, poštanske i kurirske usluge.

1. UVOD

Konkurencija u poštanskim i kurirskim djelatnostima je sve snažnija te je potrebna jaka diferencijacija, uvođenje inovacija te nadasve kvaliteta u pristupu informacijama, znanju i tehnologiji. Osim cijene, koja je nerijetko presudna u ostvarivanju konkurentske prednosti u odnosu na druge, sve značajniji utjecaj ima i kvaliteta te njen utjecaj na zadovoljstvo kupaca. Pri definiranju razine kvalitete bitno je nadzirati sve poslovne procese te utvrditi jesu li očekivanja korisnika zadovoljena. U ovom se radu, na primjeru poduzeća koje pruža poštanske i kurirske usluge, provodi FME analiza te se ispituju unutrašnja kontrola kvalitete, kao i njezino upravljanje prema kupcima, konkurentima i tržištu.

Temeljni cilj rada je identificirati i analizirati rizike u sustavu upravljanja kvalitetom poduzeća kako bi se spriječile moguće pogreške. Detaljnom analizom poduzeća moguće je prepoznati i ocijeniti potencijalne pogreške i rizike, a potom provesti odgovarajuće mjere kako bi se iste smanjile.¹ Statistička kontrola procesa pomaže kod provedbe mjera za upravljanje rizicima i može doprinijeti smanjenju troškova i postizanju veće razine učinkovitosti.² Prethodna istraživanja su primjenjivala studije slučaja primjene FMEA metode za upravljanje rizicima,³ ali istraživanja u području poštanskih i kurirskih djelatnosti, prema saznanjima autora, nisu zastupljena u postojećoj literaturi. Nadalje, implikacije prethodnih istraživanja upućuju na potrebu za dodatnim istraživanjima i razvojem metodologije.^{4,5} Istraživanje je provedeno metodom studije slučaja u okviru koje je izrađena dubinska analiza poslovnih procesa poduzeća te su primjenom FMEA metode ocijenjeni rizici sustava upravljanja kvalitetom i definirane mjere za unapređenje.

Provedeno istraživanje omogućuje uvid u korake procesa implementacije i provedbe FMEA metode te prikazuje stvarne učinke na odabranim poslovnim procesima. Predloženi model može poslužiti kao okvir za druga

¹ Tomislav Baković, Ines Dužević, *Integrirani sustavi upravljanja*, Zagreb, Ekonomski fakultet Zagreb, 2014.

² Berislav Žmuk, „Mogućnosti smanjenja troškova grešaka nekvalitete primjenom metoda statističke kontrole procesa“, Zbornik Ekonomskog fakulteta u Zagrebu, Vol. 10, No. 1, 2012, str. 61-79.

³ Antonio Carrizo Moreira, Luis Miguel D. F. Ferreira, Pedro Silva, „A case study on FMEA-based improvement for managing new product development risk“, *International Journal of Quality and Reliability Management*, Vol. 38, No. 5, 2020, str. 1130-1148.

⁴ Ibid.

⁵ Pisut Koomsap, Thuangporn Charoenchokdilok, „Improving risk assesment for customer-oriented FMEA“, *Total Quality Management & Business Excellence*, Vol. 29 No. 13-14, 2016, pp. 1563-1579.

poduzeća koja žele unaprijediti kvalitetu i procese upravljanja poslovnim rizicima.

2. RAZVOJ METODE ANALIZE UTJECAJA I POSLJEDICA POGREŠAKA

Metodu analize utjecaja i posljedice pogrešaka definira se kao sustavnu metodu kojom se identificiraju i suzbijaju problemi na proizvodu ili u procesu prije njihova nastanka. Njezin fokus je na prevenciji defekata, povećanju sigurnosti i rasta zadovoljstva potrošača.⁶ Punim izvornim nazivom i u osnovi induktivna metoda, metoda Analize utjecaja i posljedica pogrešaka (engl. *Failure Mode and Effect Analysis – FMEA*) jedna je od osnovnih i najčešće korištenih metoda za analizu sigurnosti i pouzdanosti tehničkih sustava. Temelji se na razmatranju svih potencijalnih kvarova komponenti sustava i njihovih učinaka na sustav. Najveća učinkovitost njezine primjene se postiže u fazi projektiranja mehaničkih sustava od strane multidisciplinarnog tima stručnjaka. Na temelju dobivenih rezultata analize, potencijalni uzroci kvara elemenata sustava uklanjaju se ili se svode na najmanju moguću mjeru. FMEA se može definirati kao sustavna skupina aktivnosti koje imaju za cilj prepoznati i procijeniti potencijalni kvar proizvoda ili procesa i učinke tog neuspjeha, identificirati radnje koje bi se mogle otkloniti ili smanjiti mogućnost potencijalnog kvara i dokumentirati cijeli proces.⁷

FMEA metodologiju se također preporučuje u okviru međunarodnih standarda kao jednu od metoda analize rizika. Njezinom primjenom poduzeće može imati sustavan proces za identifikaciju potencijalnih grešaka u ispunjavanju predviđene funkcije, za identifikaciju mogućih uzroka nedostataka kako bi se oni mogli ukloniti, te za lociranje utjecaja pogrešaka kako bi se ti utjecaji mogli smanjiti. Iako ova metoda ne zahtijeva kompliciranu statistiku kao druge, ipak može donijeti značajne uštede za poduzeće, a istovremeno i smanjiti nedostatke i troškove procesa ili proizvoda koji ne rade kako je bilo očekivano.⁸

Cilj analize utjecaja i posljedica pogrešaka je poduzeti sve akcije kako bi se eliminirao ili smanjio broj pogrešaka, počevši s pogreškama najvišeg

⁶ Raymond J. Mikulak, Robin McDermott, Michael Beauregard, *The basics of FMEA*, CRC Press, 2017.

⁷ Dobrivoje M. Čatić, Slavko Arsovski, „FMEA in product development phase. In Kragujevac: 5th International Quality Conference, 2011.

⁸ Naning Aranti Wessiani, Satria Oktaufanus Sarwoko, „Risk analysis of poultry feed production using fuzzy FMEA,“ *Procedia Manufacturing*, 4, 2015, pp. 270-281.

prioriteta prema nižima.⁹ Jedan od ciljeva je i definiranje plana za nadziranje kvalitete i metode ispitivanja kako bi se smanjila vjerojatnost pojave, a povećala vjerojatnost otkrivanja pogrešaka u procesu.¹⁰ Svrha FMEA-e metode je sprečavanje problema s proizvodom prije nego što se pojave. Koristeći se i u procesu projektiranja i u proizvodnji, ona značajno smanjuje troškove identificiranjem poboljšanja proizvoda i procesa u ranim fazama razvoja, kada su promjene relativno jednostavne i jeftine. Rezultat je robusniji proces jer se smanjuje ili uklanja potreba za korekcijskim djelovanjem. Službeni FMEA proces bi trebao biti dio sveobuhvatnog sustava kvalitete.¹¹ Iako se može učinkovito koristiti sama, poduzeće koje ju primjenjuje, neće imati najveću korist bez sustava koji podržavaju provođenje FMEA metode. Na primjer, jedan element sveobuhvatnog sustava kvalitete je učinkovita upotreba podataka i informacija. Bez pouzdanih podataka o proizvodu ili procesu, FMEA metoda postaje igra pogađanja koja se temelji na mišljenjima, a ne na stvarnim činjenicama. Rezultat toga može biti da se tim koji provodi FMEA metodu usredotočuje na netočne podatke, propuštajući značajne mogućnosti za poboljšanje pogrešaka koje predstavljaju najveći problem. Drugi primjer koji podržava potrebu za sveobuhvatnim sustavom kvalitete je dokumentacija proizvođača jer u nedostatku evidentiranih postupaka, radnici u proizvodnom procesu bi mogli dovesti do značajnijih varijacija radeći ga malo drugačije svaki put kad se proces pokrene.¹²

2.1. Povijesni razvoj metode analize utjecaja i posljedica pogrešaka

Prema Lazibatu¹³ i Cabanes, Hubac, Le Masson i Weil¹⁴ FMEA metodu je prva počela koristiti vojska 40-ih godina prošloga stoljeća, a potom se njena primjena proširila na zrakoplovnu i automobilsku industriju. Dok Kondić,

⁹ Tonći Lazibat, *Upravljanje kvalitetom*, Znanstvena knjiga, Zagreb, 2009.

¹⁰ Živko Kondić, Leon Maglić, Duško Pavletić, Ivan Samardžić, *Kvaliteta 3: nadzori, logistika, poboljšanja, poslovna izvornost, troškovi*, Sveučilište Sjever, Varaždin, Strojarski fakultet Slavonski Brod, Tehnički fakultet Sveučilišta u Rijeci, Varaždin, 2018.

¹¹ Klause, C., „The 25th Anniversary of the AIAG FMEA Reference Manual: A Systematic Literature Review of Alternative FMEA Methods,” *Journal of Management & Engineering Integration*, Vol. 11, No. 2, 2018, pp. 37- 45.

¹² Raymond J. Mikulak, Robin McDermott, Michael Beauregard, *The basics of FMEA*, CRC Press, 2017.

¹³ Tonći Lazibat, *Upravljanje kvalitetom*, Znanstvena knjiga, Zagreb, 2009.

¹⁴ Benjamin Cabanes, Stéphane Hubac, Pascal Le Masson, Benoit Weil, „Improving reliability engineering in product development based on design theory: the case of FMEA in the semiconductor industry,” *Research in Engineering Design*, No. 32, 2021, pp. 309-329.

Maglić, Pavletić i Samardžić¹⁵ kažu da su inženjeri oduvijek primjenjivali neku vrstu FMEA metode pri analizi konstrukcija i proizvodnih procesa, a potom se sve više počela koristiti u razvoju zrakoplovne i svemirske industrije sredinom 60-ih godina prošloga stoljeća.

Prva formalna upotreba FMEA metode je korištena sredinom 60-ih godina prošloga stoljeća u zrakoplovnoj industriji gdje je glavno usredotočenje bilo, pitanje sigurnosti. Ubrzo je postala ključni alat za poboljšanje sigurnosti, posebno u kemijskoj procesnoj industriji gdje je cilj bio, a ostaje i danas, spriječiti da se dogode incidenti i nesreće. Iako su inženjeri uvijek analizirali procese i proizvode na potencijalne kvarove, postupak FMEA metode standardizira pristup i uspostavlja zajednički jezik koji se može koristiti u poduzeću, i među poduzećima. Mogu ga koristiti i netehnički i tehnički zaposlenici svih razina. U isto vrijeme primjenjuje ju i automobilska industrija kao alat za poboljšanje kvalitete.¹⁶ Američko poduzeće Ford Motor Company je 1972. razvilo FMEA modele za potrebe praćenja pouzdanosti, gdje se jedan dio odnosio na projektiranje, a drugi na proizvodnju. Prema njihovom iskustvu, primjenjujući FMEA metode spriječili su mnoge pogreške što su potom počeli primjenjivati i drugi proizvođači automobila. Ford Motor Company u svojem poslovanju kontinuirano poboljšava svoje proizvode i poslovne procese te imaju obvezne studije kod proizvodnje novih dijelova ili njihovih modifikacija.¹⁷

U suvremenim pristupima se FMEA metodologija razvija u različitim smjerovima te se koristi za upravljanje rizicima u okviru sustava kvalitete, ali i u okviru upravljanja projektima¹⁸ ili upravljanja odnosima s korisnicima.¹⁹

¹⁵ Živko Kondić, Leon Maglić, Duško Pavletić, Ivan Samardžić, *Kvaliteta 3: nadzori, logistika, poboljšanja, poslovna izvornost, troškovi*, Sveučilište Sjever, Varaždin, Strojarski fakultet Slavonski Brod, Tehnički fakultet Sveučilišta u Rijeci, Varaždin, 2018.

¹⁶ Raymond J. Mikulak, Robin McDermott, Michael Beauregard, *The basics of FMEA*, CRC Press, 2017.

¹⁷ Živko Kondić, Leon Maglić, Duško Pavletić, Ivan Samardžić, *Kvaliteta 3: nadzori, logistika, poboljšanja, poslovna izvornost, troškovi*, Sveučilište Sjever, Varaždin, Strojarski fakultet Slavonski Brod, Tehnički fakultet Sveučilišta u Rijeci, Varaždin, 2018.

¹⁸ Ma Guofeng, Wu Ming, „A Big Data and FMEA – based construction quality risk evaluation model considering project schedule for Shanghai apartment projects,“ *International Journal of Quality & Reliability Management*, Vol. 37, No. 1, 2019, pp. 18-33.

¹⁹ Peter Madzík, Arash Shahin, „Customer categorization using a three-dimensional loyalty matrix analogous to FMEA,“ *International Journal of Quality and Reliability Management*, Vol. 38, No. 8, 2020, pp. 1833-1857.

Guofeng i Ming²⁰ povezuju Big Data i FMEA metodu kako bi upravljali rizicima projekata u građevinarstvu. Jedno od istraživanja je pristupilo daljnjem razvoju FMEA metode kroz integraciju modela temeljenog na računalstvu u oblaku i proširenom relacijskom analizom, na temelju čega je razvijen kvalitetniji pristup izračunavanju RPNa, a testiran je u industriji papira.²¹ Chen, Liu i You²² su razvile novi pristup za analizu rizika u zdravstvu, temeljen na primjeni slikovitih nejasnih setova (PFS-a) te su potvrdile primjenjivost FMEA analize na zdravstveni sektor.

2.2. Vrste metode Analize utjecaja i posljedica pogrešaka

Iz pojedinačnih definicija koje opisuju metodu analize utjecaja i posljedica pogrešaka prepoznajemo da imaju snažnu orijentiranost u sprečavanju mogućih pogrešaka, njihovu eliminaciju ili smanjivanje na najmanju moguću razinu. Može se primjenjivati u svim djelatnostima i različitim poslovnim procesima, stoga je njezina prilagodljivost promatranom problemu omogućila da se dijeli na četiri osnovne vrste:

1. **FMEA sustava** (ili koncepcije) primjenjuje se u analizi cjelokupnog sustava i podsustava u razvoju koncepta dizajna. Sagledavaju se potencijalne pogreške koje nastaju u koncepcijskoj fazi, te se promatra međuovisnost svih čimbenika sustava.
2. **FMEA dizajna** je orijentirana na izgled proizvoda jer je to ono što kupac prvo zamjećuje. Da bi proizvod bio atraktivan i u istoj razini kvalitetan, analiza se provodi prije nego što se krene s proizvodnjom odabranog proizvoda.
3. **FMEA procesa** definira ulazne i izlazne komponente procesa, kontrolne mjere te resurse koji su potrebni za njezinu primjenu. Da bi se ostvarila maksimalna korist ove metode potrebno je definirati sve procese i procesne korake te je poželjan i grafički prikaz kako se ne bi zanemarili i neki dijelovi koji bi se mogli s gledišta troškova činiti nebitni.
4. **FMEA usluge** koristi se prije nego što je usluga isporučena krajnjem potrošaču. Usluga je neopipljiva, nedjeljiva, ne pruža moguć-

²⁰ Ma Guofeng, Wu, Ming, „A Big Data and FMEA – based construction quality risk evaluation model considering project schedule for Shanghai apartment projects,“ *International Journal of Quality & Reliability Management*, Vol. 37, No. 1, 2019, pp. 18-33.

²¹ Hu-Chen Liu, Li-En Wang, Xiao-Yue You, Song-Man Wu, „Failure mode and effect analysis with extended grey relational analysis method in cloud setting,“ *Total Quality Management & Business Excellence*, 2017, pp. 745-767.

²² Ibid.

nost skladištenja, što se uz heterogenost, najviše očituje u poimanju pojma kvalitete i subjektivnog osjećaja zadovoljstva potrošača (Dobrovic, Tadic i Stanko, 2008).²³

Najbolji model za poduzeće ovisi o vrsti poslovanja, zahtjevima kupaca te postojećem sustavu kvalitete koje poduzeće već primjenjuje.²⁴ Pojedini autori su proširili primjenu FMEA metode i na druga područja upravljanja kvalitetom. Primjerice, Madzík i Shahin²⁵ primjenjuju FMEA metodu kako bi preciznije klasificirali kupce u različite segmente i time poboljšali njihovu lojalnost.

3. POSTUPAK IZRADE I PRIMJENE METODE ANALIZE UTJECAJA I POSLJEDICA POGREŠAKA

Pri analizi utjecaja i posljedica pogrešaka, prioritet se stavlja na pogreške koje mogu izazvati ozbiljne posljedice, učestalost pojavljivanja i mogućnosti otkrivanja.²⁶ FMEA također dokumentira trenutno znanje i radnje vezane uz rizike pogrešaka za kontinuirano poboljšavanje. Koristi se tijekom faze projektiranja s ciljem izbjegavanja budućih kvarova, a kasnije za kontrolu procesa, prije i tijekom odvijanja procesa. Idealna primjena bi bila tijekom najranijih konceptualnih faza projektiranja i kasnije nastavak tijekom čitavog životnog ciklusa proizvoda ili usluge. Ishodi razvoja FMEA metode su radnje za sprječavanje ili smanjenje ozbiljnosti ili vjerojatnosti pogrešaka ili nedostataka, počevši od onih s najvišim prioritetom.²⁷ Jednako tako, može se koristiti za procjenu prioriteta upravljanja rizicima, za ublažavanje poznatih prijetnji te pomaže u odabiru aktivnosti kojima će se smanjiti kumulativni učinci

²³ Tomislav Dobrovic, Diana Tadic, Zoran Stanko, „FMEA metoda u upravljanju kvalitetom,“ *Poslovna Izvrsnost*, Vol. 2, No. 2, 2008, str. 97.

²⁴ Raymond J. Mikulak, Robin McDermott, Michael Beauregard, *The basics of FMEA*, CRC Press, 2017.

²⁵ Peter Madzík, Arash Shahin, „Customer categorization using a three-dimensional loyalty matrix analogous to FMEA,“ *International Journal of Quality and Reliability Management*, Vol. 38, No. 8, 2020, pp. 1833-1857.

²⁶ Benjamin Cabanes, Stéphane Hubac, Pascal Le Masson, Benoit Weil, „Improving reliability engineering in product development based on design theory: the case of FMEA in the semiconductor industry,“ *Research in Engineering Design*, No. 32, 2021). pp. 309-329.

²⁷ Klause, C., „The 25th Anniversary of the AIAG FMEA Reference Manual: A Systematic Literature Review of Alternative FMEA Methods,“ *Journal of Management & Engineering Integration*, Vol. 11, No. 2, 2018, pp. 37- 45.

posljedica životnog ciklusa proizvoda ili usluge zbog pogrešaka u sustavu.²⁸

Na Slici 1 prikazana je metodologija analize utjecaja i posljedica pogrešaka gdje se može primijetiti kako FMEA metoda identificira rizik od neuspjeha i njegove učinke pomoću tri faktora:²⁹

- Ozbiljnost pogreške – *Severity number (S)*
- Vjerojatnost pogreške – *Probability number (P)*
- Otkrivanje pogreške – *Detection number (D)*

Ozbiljnost pogreške (S) prenosi posljedicu kvara ili pogreške ako se dogodi. Pojava (P) odražava vjerojatnost ili učestalost kvara, dok je otkrivanje (D) vjerojatnost da se pogreška otkrije prije nego što se utjecaj učinka ostvari. Svaka pogreška i učinak potencijalnog kvara ocijenjeni su u svakom od ova tri faktora na ljestvici u rasponu od 1 do 10.

Slika 1. Metodologija FMEA metode



Izvor: izrada autora prema Aravinth, P., Arun Muthu Kumar, Arun Dakshinamoorthy, N. Kumar, „A criticality study by design failure mode and Effect analysis (FMEA) procedure in LINCOLN V350 PRO welding machine,“ *International Journal of Advances in Engineering & Technology*, Vol. 4, No. 1, 2012, p. 612.

²⁸ Aravinth, P., Arun Muthu Kumar, Arun Dakshinamoorthy, N. Kumar, „A criticality study by design failure mode and Effect analysis (FMEA) procedure in LINCOLN V350 PRO welding machine,“ *International Journal of Advances in Engineering & Technology*, Vol. 4, No. 1, 2012, pp. 611-617.

²⁹ Koomsap, P., Thuangporn Charoenchokdilok, „Improving risk assesment for customer-oriented FMEA,“ *Total Quality Management & Business Excellence*, Vol. 29 No. 13-14, 2016, pp. 1563-1579.

Utvrđivanje razine rizika dobiva se množenjem ocjena ozbiljnosti, vjerojatnosti i otkrivanja, odnosno, broj (pokazatelj) veličine rizika je:

$$\text{RPN} = \text{S} \cdot \text{P} \cdot \text{D}$$

Broj prioriteta rizika koristi se za rangiranje potrebe za korektivnim radnjama kako bi se uklonile ili smanjile potencijalne pogreške. Najprije treba pristupiti pogreškama ili kvarovima s najvećih RPN-ovima, iako posebnu pozornost treba posvetiti kada je rang ozbiljnosti visok bez obzira na RPN. Nakon poduzimanja korektivnih radnji, utvrđuje se novi RPN s novom procjenom ozbiljnosti, vjerojatnosti i otkrivanja, koji se naziva „rezultirajući RPN“, te se poboljšavanje i korektivne radnje moraju nastavljati sve dok on ne bude na prihvatljivoj razini za sve moguće pogreške.³⁰

3.1. Postupak izrade metode Analize utjecaja i posljedica pogrešaka

Postupak primjene FMEA-e metode se temelji na izradi dijagrama tijeka procesa, a sastoji se od sedam koraka.

3.1.1. Formiranje FMEA tima

Organizacija rada na analizi utjecaja i posljedica pogrešaka kreće imenovanjem odgovorne osobe za stvaranje tima. Ovisno o tome koje se FMEA metoda provodi, kao odgovorna osoba se imenuje voditelj tog odjela. Kod FMEA dizajna odgovorna osoba će biti voditelj iz odjela za dizajn proizvoda, dok će kod FMEA procesa vođa tima biti iz odjela tehnologije. Odabir ostalih članova vrši se dogovorom između osoba koje su odgovorne za stvaranje FMEA tima.

3.1.2. Izrada plana rada i priprema za analizu

Plan rada i priprema za analizu od iznimne su važnosti za uspješno provođenje postupka FMEA metode. U pripremnoj fazi, vođa tima upoznaje članove tima sa strukturom promatranog sustava i načinom njegova rada pomoću odgovarajuće dokumentacije (projektni zadaci, osnovni podaci o proizvodu i njegovoj strukturi, tehnički uvjeti, dizajn). Nakon što su svi članovi tima upoznati s predmetom analize, svaki član u svom daljnjem radu pripre-

³⁰ Aranti N. Wessiani, Satria Oktaufanus Sarwoko, „Risk analysis of poultry feed production using fuzzy FMEA,“ *Procedia Manufacturing*, 4, 2015, pp. 270-281.

ma relevantnu dokumentaciju i podatke o predmetu analize iz područja koje pokriva njegova funkcionalna jedinica u poduzeću. Na temelju prikupljenih informacija svaki član tima dolazi do vlastitih zaključaka.

3.1.3. Analiza potencijalnih pogrešaka

Sustavnom analizom načina rada i funkcionalnih parametara pojedinih komponenti sustava otkrivaju se svi mogući utjecaji na rad sustava, mogući uzroci i posljedice kvara komponente sustava. Identifikacija mogućih pogrešaka može se provesti primjenom analize stabla grešaka ili pomoću Ishikawa grafikona. U svrhu procjene rizika od kvara, potrebno je zabilježiti planirane mjere kontrole za otkrivanje uzroka kvara u ovoj fazi.

3.1.4. Procjena projekta

Timska ocjena pojavljivanja kvara (P), ocjena ozbiljnosti učinaka kvara (S) i ocjena detekcije za način mogućeg kvara (D) te izračun broja prioriteta rizika (RPN) provodi se u fazi procjene projekta, na temelju prikupljenih podataka o svakom paru uzrok-neuspjeh. Rangiranjem izračunatih vrijednosti za broj prioriteta rizika i usvajanjem kriterija za ozbiljnost kvara, stvara se osnova za slanje prioriteta za provođenje mjera za poboljšanje kvalitete.

3.1.5. Rad na poboljšanju kvalitete

Za svaki kritični način kvara predlažu se preventivne/korektivne mjere kako bi se smanjile neke ili sve vrijednosti faktora rizika. Odabiru se osobe odgovorne za provođenje ovih mjera i određuju rokovi za njihovo izvršenje. Izum mjera poboljšanja kvalitete treba postići u multidisciplinarnim radnim skupinama, uz primjenu odgovarajućih tehnika kreativnosti.

3.1.6. Procjena učinaka korektivnih mjera

Nakon uvođenja mjera poboljšanja kvalitete, FMEA tim ima zadatak utvrditi učinke njihove primjene, procjenom vrijednosti novih čimbenika rizika koristeći iste kriterije procjene. FMEA analiza dovodi do zaključka jesu li ispunjeni usvojeni kriteriji akutnosti, kako za pojedinačne vrijednosti faktora rizika, tako i za ukupni rizik. Ako su, čak i nakon uvođenja mjera poboljšanja kvalitete, vrijednosti faktora rizika veće od usvojenih graničnih vrijednosti, nove mjere se definiraju i provode sve dok vrijednosti procjene ne budu zadovoljavajuće.

3.1.7. Dokumentiranje FMEA-e

Za dokumentaciju FMEA metode koristi se prazan obrazac koji se ispunjava paralelno s provođenjem pojedinih faza postupka. Svaka promjena projekta mora biti popraćena promjenom dokumentacije FMEA. Obrazac za dizajn FMEA nije univerzalan i nije standardiziran. Svako poduzeće ima svoj oblik koji odražava potrebe organizacije i kupaca.³¹

U obrascu za dokumentiranje se unose osnovni elementi FMEA metode:

- utvrđivanje pogrešaka i njihovih posljedica,
- procjena S, P, D i izračun RPN-a,
- poduzimanje korektivnih i preventivnih radnji,
- provjera učinkovitosti poduzetih aktivnosti te izračun novog RPN-a.

Procjene ozbiljnosti pogreške (S), vjerojatnosti pojave pogreške (P) i otkrivanja pogreške (D) se određuju prema skali od 1 do 10, a kriteriji su navedeni u nastavku.

1. Ozbiljnost pogreške (S)	1	Beznačajna pogreška
	2, 3	Malena pogreška
	4, 5, 6	Umjerena pogreška
	7, 8	Velika pogreška
	9, 10	Vrlo velika pogreška
2. Vjerojatnost pogreške (P)	1	Neznatna
	2, 3	Malena
	4, 5, 6	Umjerena
	7, 8	Velika
	9, 10	Vrlo velika
3. Otkrivanje pogreške (D)	1, 2	Vrlo velika
	3, 4	Velika
	5, 6	Umjerena
	7, 8	Mala
	9	Veoma malena
	10	Nema mogućnosti otkrivanja pogreške

Nakon što se za svaki proces ili funkciju odrede pogreške i njihove posljedice, te izvrši procjena ozbiljnosti, vjerojatnosti i otkrivanja pogreške, izračunava se RPN te se preventivne radnje prvo usmjeravaju na one pogreš-

³¹ Dobrivoje M. Čatić, Slavko Arsovski, „FMEA in product development phase. In Kragujevac: 5th International Quality Conference, 2011.

ke koje imaju najviši RPN. Nakon poduzetnih korektivnih mjera izračunava se novi RPN i upisuju nove vrijednosti.³²

Za prikupljanje i analizu podataka u FMEA metodi, koriste se *tablice, matrice, kontrolne karte, brainstorming, dijagrami afiniteta, dijagrami tijeka procesa, histograme te ostali alati za prikupljanje i analizu podataka i procesa*.³³

4. EMPIRIJSKO ISTRAŽIVANJE UTJECAJA I POSLJEDICA POGREŠAKA NA PRIMJERU POŠTANSKIH I KURIRSKIH DJELATNOSTI

Empirijsko istraživanje primjene metode analize utjecaja i posljedica pogrešaka temelji se na poslovnom slučaju u malom poduzeću koje se bavi uslugama dostave robe „od vrata do vrata“. Kroz uvid u internu dokumentaciju poduzeća i metodom intervjua, prikupljeni su primarni podaci koji su potom obrađeni koristeći FMEA metodu.

4.1. Metodologija istraživanja

Poduzeće nudi usluge kao što su kopneni, vođeni i zračni prijevoz, prekrcaj tereta i skladištenje, djelatnost pakiranja te kurirske usluge. Poduzeće u Republici Hrvatskoj posluje od 2002. godine te je član austrijske grupacije koja svoje podružnice ima i u drugim europskim državama kao što su Slovenija, Austrija, Njemačka i ostale. Kako je riječ o malom poduzeću, ono broji samo tri zaposlenika koji su raspoređeni po funkcijama, odnosno svaka osoba pojedinačno vodi operativni, komercijalni i financijski odjel. Prikupljenim podacima i informacijama od strane zaposlenika, primijenit će se metoda *FMEA* na usluge.

Poduzeće kao svoju osnovnu djelatnost pruža logističke usluge, odnosno organizaciju dostave robe, koja uključuje otpremu i dopremu unutar članica EU kao i izvoz robe u zemlje izvan Carinske unije. Fokus je stavljen na brze („express“) pošiljke u roku 24 sata te je primaran cilj ostvariti poslovnu suradnju s kupcima koji zahtijevaju pouzdanu, sigurnu i brzu dostavu od vrata do vrata. Stoga je istraživanje provedeno u operativnom odjelu koji vodi i organizira poslovne aktivnosti kako bi pružene usluge bile kvalitetne i ispunile zadovoljstvo kupaca.

³² Živko Kondić, Leon Maglić, Duško Pavletić, Ivan Samardžić, Kvaliteta 3: nadzori, logistika, poboljšanja, poslovna izvornost, troškovi, Sveučilište Sjever, Varaždin, Strojarski fakultet Slavonski Brod, Tehnički fakultet Sveučilišta u Rijeci, Varaždin, 2018.

³³ Tonći Lazibat, Upravljanje kvalitetom, Znanstvena knjiga, Zagreb, 2009.

4.2. Rezultati istraživanja

FMEA usluge se primjenjuje *prije isporuke kupcu* uz analizu svih indikatora koji osiguravaju da usluga bude na visokoj razini kvalitete. U odabranom poduzeću izvršena je analiza utjecaja i posljedica pogrešaka prilikom pružanja usluge dostave u roku 24 sata, koja se najčešće primjenjuje. Rezultati istraživanja su prikazani u obrascu za dokumentiranje FMEA metode u Tablici 1. Prema provedenoj analizi koja je prikazana u Tablici 1 primjećuje se kako se usluga koju poduzeće pruža sastoji od nekoliko koraka, tj. aktivnosti. To su zaprimanje upita za ponudom putem e-maila, zaprimanje naloga za prijevoz, bukiranje naloga za prijevoz te preuzimanje i isporuka robe. Uočava se da su tri moguće pogreške s izrazito visokim prioriternim faktorom rizika, četiri pogreške imaju relativno viši RPN koji ukazuje da su korektivne radnje potrebne, dok su preostale četiri pogreške skoro pa zanemarive, ali su jednako tako prevencijom, njihove vrijednosti smanjene.

Prve korektivne radnje su usmjerene na one pogreške koje ukazuju na posljedice koje mogu biti opasne za poduzeće, odnosno na one pogreške kojima je pokazatelj rizika visok, stoga će ih se prema tom kriteriju u nastavku i prikazati.

1. RPN = 270 (pogreška broj 8, dostava kasni jedan dan)

Prilikom isporuke robe jedna od mogućih pogrešaka jest da dostava kasni jedan dan zbog vozila u kvaru, te je pokazatelj rizika najveći, budući da se radi o vrlo ozbiljnoj greški koja je na skali određena brojem 10. Vjerojatnost je ocijenjena malenom (1/4000) što je prema skali određeno brojem 3, dok je mogućnost otkrivanja pogreške veoma malena (9). Korektivnim radnjama se utjecalo na smanjivanje vjerojatnosti pojavljivanja pogreške s 3 na 2, i to češćim provjerama i servisiranja dostavnih vozila, te samim time i na smanjivanje mogućnosti otkrivanja pogreške s 9 na 3, prije nego što do kvara dođe. Time je novi RPN snižen za 77,78%.

Tablica 1. Analiza utjecaja i posljedica pogrešaka na primjeru odabranog poduzeća u pružanju usluge dostave u roku 24 sata

FMEA		Predmet analize: Usluga dostave u roku 24 sata Naručitelj: Marija Roždijevac (za potrebe diplomskog rada) Datum: 06.08.2021.			S-ozbiljnost pogreške P-vjerojatnost pogreške D-otkrivanje pogreške RPN- Prioritetni faktor rizika				1 vrlo malo 2-3 malo 4-6 srednje 7-8 visoko 9-10 vrlo visoko				Korektivne i preventivne radnje		Stanje nakon popravka			
Broj	Aktivnost	Vrsta greške	Uzrok greške	Posljedica	S	P	D	RPN	Odgovorna osoba	Poduzete radnje	S	P	D	RPN				
1.	Zaprimanje upita za ponudom	Ponuda nije poslana	Prijevoz nije moguće organizirati	Kupac zamjera što nije dobio povratnu informaciju	2	1	2	4	Operativni djelatnik	Kupcu je javljeno da prijevoz nije moguće organizirati	2	1	1	2				
2.	Zaprimanje upita za ponudom	Ponuda kasno poslana	Upit nije stigao na točnu e-mail adresu	Kupac je već našao drugo rješenje	9	3	8	216	Operativni djelatnik	Češća provjera svih datoteka (kao što je bezvrijedna pošta)	9	2	1	18				
3.	Zaprimanje naloga	Potvrda o zaprimljenom nalogu nije poslana nalogodavatelju	Nije poslana potvrda o zaprimljenom nalogu	Kupac nije siguran hoće li se transport organizirati	7	1	2	14	Operativni djelatnik	Vrši se provjera za svaki primljeni nalog i šalje potvrdu nalogodavcu	7	1	1	7				
4.	Zaprimanje naloga	Nedostaju podaci radnog vremena skladišta utovara/istovara, netočni referentni brojevi za utovar...	Nije izvršena provjera jesu li predani svi potrebni podaci	Zbog nedostatka informacija gubi se vrijeme i ne stigne se u roku organizirati prijevoz	9	6	4	216	Operativni djelatnik	Nalazi se zaprimaju tek uz potvrdu nalogodavca da su svi potrebni podaci predani	9	2	2	36				
5.	Bukiranje naloga	Uneseni podaci nisu ispravni (broj ili vrsta robe, ili radno vrijeme, ili kontakt osoba, ili dr.)	Nije izvršena provjera točnosti podataka	Kupac nezadovoljan jer roba neće biti isporučena na vrijeme	10	2	4	80	Operativni djelatnik	Nalazi se unose tek nakon provjere svih podataka	10	1	2	20				
6.	Bukiranje naloga	Nalog je kasno unesen u sustav	Nije izvršena dodatna provjera za vremensko ograničenje	Kupac zamjera što na vrijeme nije obaviješten da će isporuka kasniti	10	2	1	20	Operativni djelatnik	Sustav obavještava o isteku roka, nalog je automatski prebačen za sljedeći dan	10	1	1	10				
7.	Preuzimanje robe	Nije preuzeta cjelokupna pošiljka	Podaci o količini i broju paketa pogrešno uneseni u sustav	Nezadovoljstvo kupca	7	2	6	84	Operativni djelatnik	Komunikacija centrale s dostavljačem radi usklade	7	1	3	21				
8.	Isporuka robe	Dostava kasni jedan dan	Vozilo u kvaru	Nezadovoljstvo kupca, uz razumijevanje na utjecaj više sile.	10	3	9	270	Vozač	Češće provjere i servisi vozila	10	2	3	60				
9.	Isporuka robe	Nedostaje dokaz o dostavi (POD "proof of delivery")	Nisu uneseni podaci u sustav	Nezadovoljstvo kupca	4	3	5	60	Dostavljač	Sustav upozorava dostavljača na nedostatak podataka	4	2	1	8				
10.	Isporuka robe	Oštećena pošiljka	Nepropisno rukovanje u transportu	Reklamacija kupca	10	3	2	60	Dostavljač ili djelatnici u skladištu	Uveden nadzorni susav	10	1	1	10				
11.	Isporuka robe	Izgubljena pošiljka	Pošiljka nije skenirana u zadnjem skladištu	Troškovi odštete za izgubljenu pošiljku	10	1	2	20	Djelatnici u skladištu	Uveden nadzorni susav	10	1	1	10				

Izvor: Izrada autora na temelju istraživanja odabranog poduzeća.

2. RPN = 216 (pogreška broj 2, zakašnjela ponuda)

U poduzeću vrijedi izreka „vrijeme je novac“ stoga je svaki trenutak važan i može biti presudan. Kod zaprimanja upita za ponudom bitno je u što kraćem roku dati najbolje moguće rješenje kupcu. Stoga se vidi da je veliki značaj ozbiljnosti pogreške ocijenjene na skali 9, ukoliko je ponuda kasno poslana. Uzroci takvih pogrešaka su najčešće da upiti koji se šalju putem e-maila odlaze u bezvrijednu poštu, tada zakašnjelom reakcijom propušta se poslovanje, kupac nema vremena i traži drugo rješenje. Zbog nastale pogreške uvodi se redovita provjera svih datoteka u mapama e-maila čime je promijenjena mala mogućnost otkrivanja pogreške u vrlo veliku (na skali 1) i time je novi pokazatelj veličine rizika smanjen na samo 18.

3. RPN = 216 (pogreška broj 4, nepotpuni podaci)

Na ljestvici ozbiljnih pogrešaka prilikom zaprimanja naloga jest ukoliko dođe do propusta i ne provjere se svi potrebni podaci. Nalogodavac u ovom slučaju zbog hitnosti postupka organizacije prijevoza, većinom šalje osnovne podatke bez da je provjerio jesu li svi poslani podaci i potpuni. Takve pogreške se najčešće otkriju tek prilikom dolaskom dostavljača na mjesto utovara i zbog nepodudaranja informacija sa stvarnom situacijom, bilo da je riječ o skraćenom radnom vremenu skladišta ili da referentni brojevi za utovar nisu točni, utovar se ne može ostvariti i novi nalog se čeka kad se podaci isprave. Uvođenjem obvezne provjere točnosti svih podataka smanjila se vjerojatnost pojavnosti tih pogrešaka sa 6 na 2, a mogućnost otkrivanja pogreške je postala velika. Korektivnim radnjama novi izračun RPN-a iznosi 36.

4. RPN = 84 (pogreška broj 7, nije preuzeta cjelokupna pošiljka)

Nezadovoljstvo kupca je često izraženo ukoliko usluga nije u potpunosti izvršena. Zbog brzih reakcija operativnih djelatnika zna doći do grešaka prilikom upisivanja u sustav i pošiljka se u tom slučaju mora preuzimati i dostavljati na dva puta. Kako bi se takva velika pogreška izbjegla uvodi se pravilo da dostavljač, dok je na licu mjesta utovara, zove centralu kako bi se podaci u sustavu korigirali i kako bi se preuzela kompletna pošiljka koja odgovara točnom broju koleta i pojedinačnoj težini istih. Na taj način novi RPN iznosi samo 21 uz pedesetpostotno povećanje ocjene sposobnosti otkrivanja pogreške.

5. RPN = 80 (pogreška broj 5, podaci nisu ispravni)

Kako je riječ o usluzi kod koje je najvažnije vrijeme i brzina, ponekad pošiljatelj i primatelj ne razmijene sve potrebne podatke. Vrlo čest slučaj zna biti da se, u proteku vremena od javljanja spremnosti robe do davanja naloga organizatoru prijevoza, promijene težine i količina robe. U tom slučaju pošiljatelj čini najbolje za kupca, što više spremne robe slati čim prije, ali tada podaci nisu na vrijeme proslijeđeni operativnom djelatniku i dolazi do mogućnosti otkazivanja naloga. Kao prevencija, uvodi se da operativni djelatnik prilikom obavještavanja pošiljatelja o dolasku vozača po robu, također provjeri i o kojoj količini i težini robe se radi. Time je vjerojatnost pojave pogreške smanjena za jednu jedinicu dok je mogućnost otkrivanja postala za 50% veća.

6. RPN = 60 (pogreška broj 9, nema dokaza o dostavi)

Iako je prilikom dostave nedostatak dokaza o dostavi klasificiran kao umjerena pogreška, bitno utječe na zadovoljstvo kupca. Kupac želi brzu i pouzdanu dostavu, a kako su informacije odmah dostupne, ukoliko shvati da ih on nema kada su mu potrebne, mogu ukazivati da je nešto pošlo po zlu i da će možda doći do kašnjenja. Uvođenjem novih pravila o preuzimanju i dostavljanju robe zbog epidemioloških mjera uzrokovane pandemijom od 2019. godine, dostavljači nisu dužni inzistirati na fizičkom kontaktu s primateljem pošiljke, pa samim time i zahtijevanju njihovih podataka. Kod takvih situacija dolazi do propusta i „nedostavljenih“ pošiljaka u sustavu, stoga je uveden poboljšani digitalni sustav koji upozorava dostavljača i zahtijeva da se pošiljka „zaključí“. Na taj način je mogućnost otkrivanja pogreška povećana na najveću moguću razinu a novi RPN iznosi samo 8.

7. RPN = 60 (pogreška broj 10, oštećenje pošiljke)

Vrlo velika pogreška je ako se dostavi oštećena pošiljka. To svakako rezultira dodatnim troškovima i gubitak povjerenja kupca. Kako su vrlo male vjerojatnosti i mogućnosti otkrivanja takvih pogreška, ipak je preventivnim radnjama, kao što su poboljšani video nadzor u skladištu prilikom prekrcaja i ostalih manipulativnih radnji, na skali vjerojatnosti pojavnost povećana za dvije jedinice dok je na skali mogućnosti otkrivanja pogreške ona povećana za samo jednu jedinicu.

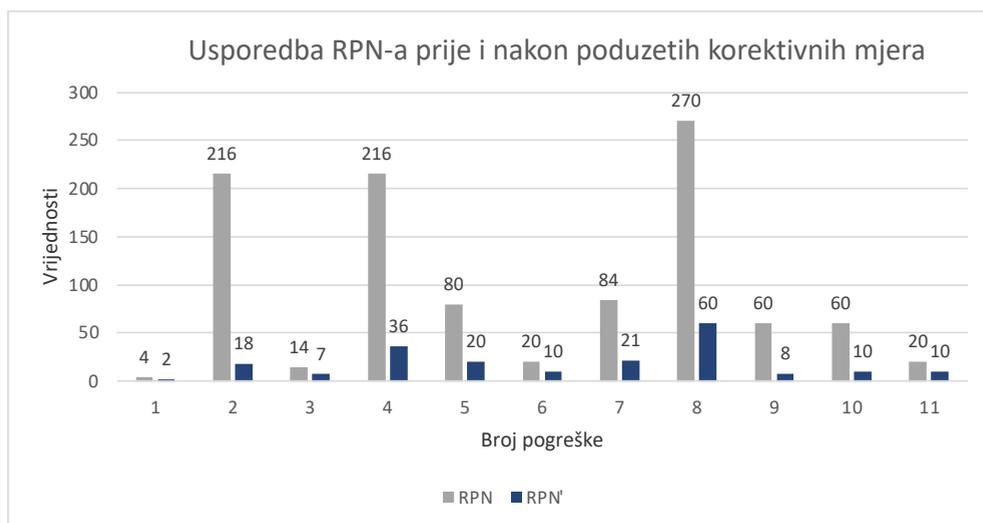
8. RPN = 20 i <20 (pogreške brojevi 1, 3, 6, 11)

U skoro zanemarive pogreške ubrajaju se preostale kojima je većinom ista ili slična vjerojatnost, odnosno mogućnost otkrivanja pogreške. Pa su tako prema skali vjerojatnosti pogreške ocijenjene kao neznatna vjerojatnost pogreške ili pogreška nije vjerojatna, ukoliko:

- nije poslano kupcu da se nema opcija za traženi prijevoz (1),
- nije poslano kupcu da je nalog zaprimljen i da će biti realiziran (1),
- pošiljka bude izgubljena (1),

dok je pogreška broj 6, kada je nalog kasno unesen ocijenjena kao malena vjerojatnost pogreške (2). Slična situacija je i kod mogućnosti otkrivanja pogreške gdje su sve ocijenjene na skali kao vrlo velika mogućnost otkrivanja (2) osim pogreške broj 6 gdje je ta mogućnost na skali ocijenjena za jedinicu više, odnosno (1).

Slika 2. Usporedba RPN-a prije i nakon poduzetih korektivnih mjera

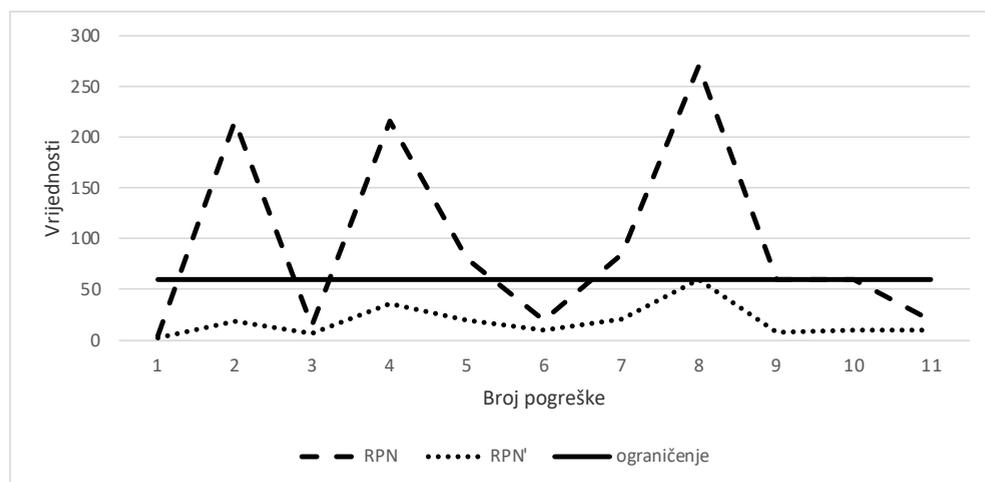


Izvor: Izrada autora.

Iako sve navedene pogreške nisu opasne i nemaju mogućnost ostavljanja većih posljedica na poslovanje, te su njihovi izračuni procjena veličine rizika iznosili 4, 14, 20 i 20, treba napomenuti kako je uvođenjem korektivnih radnji njihov RPN smanjen za 50% te su rezultirajući novi RPN iznosili 2, 7, 10 i 10.

Na obrascu je vidljivo da su većinom ozbiljne pogreške, kod prvog izračuna RPN-a, označene crvenom bojom koje ukazuju na uvođenje preventivnih mjera, te se nakon poduzetih korekcija zaključuje da poduzeće ima malo ograničenje, odnosno poželjna granica potencijalnog rizika ne bi trebala prelaziti broj 60, kao što je prikazano na slikama 3 i 4.

Slika 3. Usporedba RPN-a prije i nakon poduzetih korektivnih mjera s ograničenjem



Izvor: izrada autora

Provedenom analizom zaposlenici poduzeća potvrđuju poboljšanja pouzdanosti, kvalitete i zadovoljstvo potrošača, te smanjenje troškova jer je omogućeno prepoznavanje pogrešaka prije samih aktivnosti u poslovnom procesu. Pokazalo se da je FMEA metoda vrlo fleksibilna te da se može koristiti u različitim fazama pružanja usluga te uz sve aktivnosti koje se uz njih direktno i indirektno povezuju.

Učinkovitost FMEA analize je potvrđena i na drugim uslužnim djelatnostima. Primjerice, Mascia i sur.³⁴ su pokazali da ova metoda olakšava upravljanje rizicima i omogućuje podizanje razine djelotvornosti i učinkovitosti u aktivnostima znanstvenih istraživanja u okviru istraživačkih labo-

³⁴ Anna Mascia Sirafici, Antonella Bongiovanni, Gianni Colotti, „A failure mode and effect analysis (FMEA) – based approach for risk assessment of scientific processes in non-regulated reserach laboratories,“ Accreditation and Quality Assurance, Vol. 25, 2020, pp. 311-321.

ratorija. Chen, Liu i You³⁵ su potvrdile učinkovitost primjene FMEA metode u zdravstvu, a klasični model su unaprijedile primjenom slikovnih nejasnih setova (PFS-a). Guofeng i Ming³⁶ su pokazali da je FMEA metoda učinkovita za upravljanje rizicima kvalitete u građevinskoj industriji, a koristili su inovativan model koji integrira FMEA metodu s Big Data tehnikama. Nadalje, Carrizo Moreira i sur.³⁷ su pokazali da je FMEA metoda koristan alat za upravljanje rizicima prilikom razvoja i dizajniranja novog proizvoda.

4.3. Ograničenja istraživanja

Provedbom analize utjecaja pogrešaka i posljedica u odabranom poduzeću, prepoznati su i ocijenjeni potencijalni rizici u onoj skupini usluga koja je primarna za poduzeće i koje je kao takvo prepoznatljivo kupcima. Kako ovom studijom nisu bile analizirane i ostale usluge koje poduzeće pruža, ne možemo tvrditi da bi rezultati nakon provedene metode bili jednako uspješni. Studija slučaja je ograničena na jedno poduzeće te se nije mogla ocijeniti usporedba s konkurencijom na tržištu. Također, radi se o malom poduzeću pa nije isključiva i činjenica da zaposlenici nisu bili objektivni prilikom rangiranja i ocjenjivanja pogrešaka, kao i njihovih posljedica. Budući da je FMEA metoda dugotrajan proces i zahtijeva multidisciplinarni tim koji dobro razumije sve procese potreban je veći vremenski period za prikupljanje i analizu podataka te donošenje konkretnijih zaključaka. Jedno od mogućih proširenja predloženog modela, moglo bi biti uključivanje korisnika i naglasak na izračun RPN-ova na temelju glasa korisnika, kao što je rađeno u istraživanju Koomsapa i Charoenchokdiloka.³⁸

Unatoč navedenim ograničenjima, rezultati istraživanja upućuju na potencijal koji primjena FMEA metode ima te je za pretpostaviti kako bi sveobuhvatnija analiza otvorila nove mogućnosti unapređenja kvalitete. Na temelju prikazanog okvira za implementaciju FMEA metode druga poduzeća ili

³⁵ Hu-Chen Liu, Li-En Wang, Xiao-Yue You, Song-Man Wu, „Failure mode and effect analysis with extended grey relational analysis method in cloud setting,” *Total Quality Management & Business Excellence*, 2017, pp. 745-767.

³⁶ M. Guofeng, W. Ming, „A Big Dana and FMEA – based construction quality risk evaluation model considering project schedule for Shanghai apartment projects“, *International Journal of Quality & Reliability Management*, Vol. 37, No. 1, 2019, pp. 18-33.

³⁷ António Carrizo Moreira, Luis Miguel D. F. Ferreira, Pedro Silva, „A case study on FMEA – based improvement for managing new product development risk, *International Journal of Quality and Reliability Management*, Vol. 38, No. 5, 2020, pp. 1130-1148.

³⁸ Pisut Koomsap, Thuangporn Charoenchokdilok, „Improving risk assesment for customer-oriented FMEA,” *Total Quality Management & Business Excellence*, Vol. 29 No. 13-14, 2016, pp. 1563-1579.

organizacije mogu razviti vlastite metode upravljanja rizicima i time unaprijediti svoje sustave upravljanja kvalitetom.

5. ZAKLJUČAK

Za analizu utjecaja posljedica i pogrešaka može se konstatirati da objedinjuje niz aktivnosti kojima je cilj identificirati i analizirati potencijalne pogreške u proizvodu ili usluzi, te radnje kojima bi se uklonili ili smanjili potencijalni rizici. Bilo da je riječ o uvođenju novih proizvoda, doradi postojećih proizvoda ili pružanju usluga, omogućuje da se slabosti otkriju na vrijeme i smanji njihov utjecaj na kvalitetu proizvoda ili usluge.

U ovom radu je provedena studija slučaja poduzeća koje se bavi uslugama dostave pošiljaka od vrata do vrata. Prikupljenim podacima i primjenom FMEA metode je utvrđeno kako svaka moguća pogreška za posljedicu izaziva nezadovoljstvo kupca. Primjenom metode analize utjecaja posljedica i pogrešaka zaključuje se da su pozitivni rezultati bili vidljivi nakon uvođenja korektivnih mjera te je razina kvalitete usluge poboljšana. Dokumentirana FMEA metoda bi u budućnosti mogla poslužiti kao osnova za obučavanje i usavršavanje zaposlenika u obavljanju naknadnih analiza i planiranja novih poslovnih aktivnosti kako bi se izbjegle eventualne posljedice, a zadovoljstvo kupaca bilo iznad njihovih očekivanja.

Abstract:

APPLICATION OF THE FAILURE MODE AND EFFECTS ANALYSIS – CASE STUDY OF POSTAL AND COURIER SERVICES

Using Failure Mode and Effect Analysis, the paper explores the possibilities of improving quality using case study of postal and courier services. Modern techniques and approaches to quality management place great emphasis on risk management, and FMEA method imposes as a logic choice to do so. The purpose of this paper is to analyse the potentials and effects of the FMEA application using the case study. The procedure of application included in-depth analysis of business processes in the company, selection of priority areas, forming enforcement teams, implementation of the FMEA procedure, and corrective actions to reduce business risks. The research results showed that the application of FMEA enables significant quality enhancements while reducing business risks.

Key words: quality management, FMEA, risk management, continuous improvement, postal and courier services.

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DIGITALNA TRANSFORMACIJA ZDRAVSTVENOG SUSTAVA

DIGITAL HEALTH SYSTEM TRANSFORMATION

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SAŽETAK

Svjedoci smo kako digitalizacija, digitalna transformacija ili revolucija 4.0, ulazi u sve pore našega društva. U javnom sektoru, a jedan od njegovih bitnih dijelova jest i zdravstvo, Republika Hrvatska ulazi nedovoljno brzo ili bolje rečeno ne drži korak s vodećim zemljama Europe i svijeta. Iako je naša zemlja i prije COVID-19 krize koristila digitalne usluge, primjerice E-uputnica, E-recept, ipak je bila na samim počecima digitalne transformacije. Pandemija COVID-19 i epidemiološke mjere dovele su do bržeg korištenja dostupnih inovacija kojima je glavni cilj pojednostav-

ljenje rada liječnika, optimizacija sustava, poboljšanje ishoda liječenja pacijenata, smanjenja ljudske pogreške i smanjenje troškova. Spremnost građana i medicinskog osoblja na promjene koje nosi digitalno zdravstvo, važna su karika u digitalnoj transformaciji zdravstva. Rad ukazuje na nužnost i prednosti koje donosi digitalna transformacija zdravstvenog sustava u cilju poboljšanja usluge zdravstvene skrbi, povećanja efikasnosti zdravstvenog sustava i osiguravanja zdravstvene skrbi stanovništva tijekom svjetskih kriza poput pandemije korona virusa.

Ključne riječi: zdravstvo, digitalizacija, digitalna transformacija.

1. UVOD

Svjetska kriza koju je uzrokovao korona virus potaknula je i ubrzala implementaciju dodatnih usluga za digitalnu zdravstvenu skrb. Kao trenutni odgovor na novonastalu situaciju izazvanu COVID-19, digitalizacija zdravstva – digitalno zdravlje gleda se kao inovativno zdravstveno rješenje koje uz pridržavanje ograničenog kretanja koje sprječava prijenos i širenje virusa, ipak omogućava zdravstvenu skrb.¹

Digitalna transformacija zdravstva definirana je kao „područje znanja i prakse povezano s razvojem i korištenjem digitalnih tehnologija za poboljšanje zdravlja“². Digitalna transformacija uključuje telemedicinu, mobilne zdravstvene aplikacije, umjetnu inteligenciju (AI-artificial intelligence), analitiku velikih podataka (big data analytics), internetske stvari (Internet of things), alate koji omogućuju pohranu i razmjenu podataka nevezano za lokaciju.

Pojam digitalno zdravlje ukorijenjen je u E-zdravlju, koje je definirano kao korištenje informacijskih i komunikacijskih tehnologija u potpori zdravlju i zdravstvenim područjima.

Ciljevi digitalnog zdravlja su omogućiti jedinstveni pristup zdravstvenoj skrbi, poboljšanje kvalitete i brzine zdravstvenih usluga, kvalitetniji ishod liječenja, što bi pomoglo medicinskom osoblju u obavljanju svakodnevnih poslova, redukciji troškova liječenja, sve sa svrhom fizičkog i emocionalnog blagostanja stanovništva.

¹ John Torous, Keris Jän Myrick, Natali Rauseo-Ricupero, Jozeph Firth, „Digital Mental Health and COVID-19: Using Technology Today to Accelerate the Curve on Access and Quality Tomorrow, JMIR Ment Health 2020, Vol. 7, No. 3,e18848, 2020.

² Svjetska zdravstvena organizacija, „Nacrt globalne strategije o digitalnom zdravlju, 2020.-2024,“ 2020. URL: <https://www.who.int/docs/default-source/documents/gS4hdhaa2a9f352b0445bafbc79ca799dce4d.pdf>, (pristupljeno 1.12.2021.).

Digitalna transformacija uz digitalizaciju mijenja i poslovne procese, ali nikad ne bi smjela mijenjati načela javnog zdravstva. Dapače, trebala bi podržavati provedbu tih načela.³ Digitalizaciju treba gledati kao sredstvo koje koristi zdravstvo kako bi ispunilo svoje ciljeve i misiju.

„Ako se digitalne tehnologije žele održati i integrirati u zdravstvene sustave, one moraju biti u stanju pokazati dugoročna poboljšanja u odnosu na tradicionalne načine pružanja zdravstvenih usluga.”⁴

2. DOPRINOS DIGITALIZACIJE ZDRAVSTVU

Zdravstvo se, u cjelini, sporije pridruživalo digitalnoj revoluciji od drugih grana⁵, kao primjerice financijski sektor ili medijska industrija. Jedan od razloga vjerojatno je i tradicionalni pristup koji zagovara individualnost i odnos s pacijentom. Međutim i prije dolaska pandemije COVID-19, nove tehnologije i alati počinju ulaziti u zdravstveni sustav i nagovještavati transformaciju u pružanju zdravstvenih usluga, što znači biti učinkovitiji te pružati bolju skrb za pacijente. Pandemija COVID-19 svojim je ograničenjima, koja je nametnula u pružanju zdravstvene skrbi, to samo ubrzala.

2.1. Bolja dijagnostika

Tehnologija pruža liječnicima mogućnost da ubrzaju, istovremeno i poboljšaju svoje dijagnostičke sposobnosti jer određene snimke mogu komparirati s ranije napravljenim snimkama u svojoj bazi uz pomoć alata koji mogu obraditi, filtrirati, sortirati i organizirati velike količine podataka. To će im kasnije pomoći da brže dođu do točne dijagnoze.⁶ Takve tehnologije omogućuju

³ Europska komisija, „Procjena utjecaja digitalne transformacije zdravstvenih usluga“, Izvješće Stručnog panela o učinkovitim načinima ulaganja u zdravstvo (EXPH).

https://ec.europa.eu/health/expert_panel/sites/expertpanel/files/docsdire/022_digitaltransformation_en.pdf, (pristupljeno 28.11. 2021.).

⁴ Soumya Swaminathan, *WHO releases first guideline on digital health interventions*, <https://www.who.int/news/item/17-04-2019-who-releases-first-guideline-on-digital-health-interventions>, (pristupljeno 4.12. 2021.).

⁵ Regina E. Herzlinger, *Harvard business Review*: <https://hbr.org/2006/05/why-innovation-in-health-care-is-so-hard>, (pristupljeno 15.11. 2021.).

⁶ Ramy Arnaout, 2012, <http://clinchem.aacejnl.org/content/58/6/986.long>, (pristupljeno 15.11. 2021.).

liječnicima pregled golemih količina podataka u svojim zdravstvenim bazama. Na taj način mogu postaviti bržu i bolju dijagnozu i smanjiti mogućnost dijagnostičke pogreške, a da se one napravljene više ne ponove u budućnosti.⁷

2.2. Mobilno zdravstvo/dostupno zdravstvo

Mobilne zdravstvene aplikacije imaju potencijal transformacije pružanja zdravstvenih usluga zahvaljujući njihovoj sveprisutnosti i dostupnosti. Pametni telefoni već su u svim sferama društva i počinju se koristiti kao zdravstveni alat, ali na žalost ne u dovoljnoj mjeri. Jedan od takvih primjera je i Hrvatski proizvod tvrtke MCS d.o.o. koja je napravila aplikaciju Zdravlje.net⁸ za komunikaciju s liječnikom opće prakse (obiteljski liječnik) putem smartphonea, tableta ili računala. Pacijenti putem aplikacije traže recept, uputnicu ili neki koristan savjet. Aplikacija može pomoći i starijim osobama jer njihovi ukućani za njih mogu naručiti terapije ili dobiti savjete bez odlaska u ordinaciju, što je u ovo pandemijsko vrijeme od velike pomoći jer smanjuje gužve u čekaonici. Mobilne aplikacije šire se na druge posebno dizajnirane mobilne uređaje koji se putem bluetooth⁹ spajaju s mobilnim uređajem i preko njega šalju podatke liječniku opće prakse ili specijalistu. Ovakav način pomaže praćenju bolesnika nakon završenog kliničkog liječenja starih i nepokretnih bolesnika, ali i kao prevencija. Na takav način već se mogu pratiti krvni tlak, otkucaji srca, spirometrija, temperatura, glukometri ili CTG u trudnoći.¹⁰

2.3. Dostupnija zdravstvena usluga

U digitalnoj transformaciji zdravstva telemedicina može odigrati ključnu ulogu u povezivanju pacijenata iz ruralnih područja s liječnicima u udaljenim zdravstvenim ustanovama. Pacijenti dobivaju bržu i kvalitetniju uslugu, a bolnički sustav se rasterećuje. Liječnici mogu brže i bolje komunicirati i dijeliti znanja i iskustva. Navedeno pomaže centralizaciji znanja i stručnosti, stvara uštede državnom zdravstvenom sustavu, smanjuje troškove pacijenata

⁷ Robert El-Kareh, Omar Hasan, Gordon D. Schiff, "Use of health information technology to reduce diagnostic errors, dostupno na: <https://pubmed.ncbi.nlm.nih.gov/23852973/>, (pristupljeno 16.11. 2021.)

⁸ <https://mcs.hr/tjesenja-i-usluge/zdravlje-net/>, pristupljeno 16.11. 2021.

⁹ Elena Muller, MPH: <https://www.healthrecoveryolutions.com/blog/7-common-remote-patient-monitoring-devices>, (pristupljeno 16.11. 2021.)

¹⁰ <https://www.mesimedical.com/mesi-mtablet/>, (pristupljeno 18.11. 2021.)

i šteti dragocjeno vrijeme.¹¹ Važnost ovakvog načina najbolje se pokazala u uvjetima pandemije COVID-19.

2.4. Razvoj farmakologije i bolji ishodi liječenja

Prema nekim podacima farmaceutska istraživanja i razvoj postali su manje učinkoviti posljednjih godina.¹² Korištenjem tehnologije kao što je AI, strojno učenje može preokrenuti ovaj trend dopuštanjem virtualnoj analizi milijuna spojeva kako bi se potencijalno povećala mogućnost pronalaska novih tragova za nove lijekove. AI algoritmi za strojno učenje analiziraju sve poznate prošle eksperimente koji su pokušali otkriti i sintetizirati tvari od interesa – one koje su djelovale i što je još važnije, one koji nisu uspjeli.¹³

Velikom količinom informacija o pacijentu, njegovom stanju odnosno kliničkoj slici, vrsti terapije, kliničkim i znanstvenim studijama, koristeći alate za obradu velike količine podataka Big data, posebice analizom tih podataka, liječnici bi mogli brže, efikasnije i s većom sigurnošću odlučiti se za određeni tip terapije. Big data aplikacije imaju za cilj:

- podizanje preciznosti dijagnostičke prakse
- skraćivanje razdoblja između primarne dijagnoze i terapije
- podizanje terapeutske preciznosti.

2.5. Veća efikasnost – bolji financijski učinci uz dodanu vrijednost za pacijente

Digitalizacija u zdravstvu trebala bi omogućiti zdravstvenim djelatnicima manje administrativnog posla kako bi mogli biti efikasniji. Trenutno na naručivanje i drugi administrativni posao medicinske sestre troše 51% svog radnog vremena, a liječnici 16%.¹⁴

Korištenjem tele monitoringa – in vivo praćenje – pacijenti se mogu pratiti s jednog mjesta u stvarnom vremenu što omogućuje automatsko alar-

¹¹ Svjetska zdravstvena organizacija, 2018, Izvješće dostupno na https://www.who.int/docs/default-source/primary-health-care-conference/digital-technologies.pdf?sfvrsn=3efc47e0_2, (pristupljeno 18.11.2021.)

¹² Jack W. Scannell, Alex Blanckley, Helen Boldon, Brian Warrington, “Diagnosing the decline in pharmaceutical R&D efficiency”, National Center for Biotechnology Information, Nat Rev Drug Discov Mar 1, Vol. 11, No. 3, 2012, pp 191-200.

¹³ Jeff Carbeck, 2018, <https://www.scientificamerican.com/article/ai-for-molecular-design/>, (pristupljeno 18.11.2021.)

¹⁴ Brian Kalis i sur.,2018, <https://hbr.org/2018/05/10-promising-ai-applications-in-health-care>, (pristupljeno 21.11.2021.)

miranje u slučaju promjena prema zadanim parametrima (temperatura, EKG, tlak, itd.). Ovime se rasterećuje medicinsko osoblje stalnim obilascima pacijenata, a pacijent ima bržu reakciju. Navedeno je posebno korisno u situacijama kao što je pandemija jer smanjuje osobni kontakt na minimum.

AI je napravila velike iskorake pogotovo u domeni radiologije. AI može u kratkom vremenu pregledati ogroman broj medicinskih slika ili nalaza te pomoći u dijagnostici i pronalasku varijacija i anomalija. Godine 2011. istraživači iz NYU Langone Health otkrili su da ova vrsta automatizirane analize može pronaći i uskladiti specifične plućne čvorove (na CT slikama prsnog koša) između 62% i 97% brže od panela radiologa.¹⁵

Korištenjem novih tehnologija i digitalizacijom zdravstva ne samo da se može poboljšati rezultat u liječenju pacijenata nego i uštedjeti novac. Primjerice, ranije dijagnosticiranje mnogih karcinoma može smanjiti troškove liječenja za više od 50%.¹⁶ AI u takvom procesu ima ključnu ulogu.

3. GRAĐANI (PACIJENTI) KORISNICI USLUGA – KLJUČNI FAKTOR USPJEŠNE DIGITALIZACIJE

Digitalna transformacija odnosi se na konstantnu primjenu digitalne tehnologije i resursa kako bi se stvorili preduvjeti za nove prihode, poslovne modele i načine poslovanja. Transformacija nastaje kad poduzeće počne razmišljati o nužnoj promjeni načina poslovanja, osmišljavanju novih strategija, ulaganju u kulturu poduzeća koristeći dostupne digitalne tehnologije, a sve u cilju veće konkurentnosti, pružanju bolje usluge/proizvoda kupcima, stvarajući bolje prihode odnosno bolje poslovne rezultate.¹⁷

Digitalna transformacija zdravstva nije samo nabava novih tehnologija. Ona podrazumijeva promjenu samih procesa, ali i dionika u tim procesima. Dionici su liječnici, medicinske sestre, pomoćno medicinsko osoblje, pacijenti i njihovi bližnji. Građani također moraju promijeniti svoju „kulturu“ odnosno educiranost, kako bi znali i mogli iskoristiti benefite koje im digitalna transformacija, u ovom slučaju digitalno zdravstvo, može ponuditi za njihovu dobrobit.

¹⁵ Brian Kalis, Matt Collier, Richard Fu, „10 Promising AI Applications in Health Care“, <https://hbr.org/2018/05/10-promising-ai-applications-in-health-care>, (pristupljeno 21.11. 2021.)

¹⁶ Svjetska zdravstvena organizacija, Priopćenje za javnost, 2017, <https://www.who.int/news-room/detail/03-02-2017-early-cancer-diagnosis-saves-lives-cuts-treatment-costs>, (pristupljeno 21.11. 2021.)

¹⁷ Mario Spremić, *Digitalna transformacija poslovanja*, Ekonomski fakultet, Zagreb, 2017, str.53.

3.1. Spremnost građana za digitalno zdravlje

Prema Europskoj komisiji, koja od 2014. prati digitalni napredak država članica temeljem izvješća o indeksu gospodarske i društvene digitalizacije (DESI), Republika Hrvatska je na 20. mjestu od 28 država članica prema indeksu gospodarske i društvene digitalizacije.¹⁸

U kategoriji osoba s diplomom iz područja IKT-a (informacijsko-komunikacijska tehnologija) Republika Hrvatska je na 13. mjestu, ali je tu i podatak da 18% građana nikada nije koristilo Internet. Ono za što se najviše koristi Internet jest čitanje vijesti. U porastu je web trgovina. Ono po čemu su građani Republike Hrvatske među najlošijim zemljama u EU jesu digitalne javne usluge.

Iako Republika Hrvatska kaska za EU najviše u povezanosti odnosno dostupnosti brzog interneta, u javnim uslugama u koje spadaju i zdravstvene usluge, država i građani jako malo ulažu u informatičku edukaciju. Ono s čime naša država može biti ponosna jesu mladi.

Među državama članicama EU za 2019. godinu, Republika Hrvatska imala je najveći udio pojedinaca u dobi od 16 do 24 godine s osnovnim ili iznad osnovnih ukupnih digitalnih vještina (97%), ispred digitalno najrazvijenijih zemalja poput Estonije, Litve i Nizozemske (sve tri 93%).¹⁹

Dobri su rezultati zabilježeni i u kategoriji od 25 do 29 godina. Prema podacima Eurostata, 92% su ljudi s razvijenim digitalnim vještinama. Republika Hrvatska je treća u Europi iza Islanda i Finske. No, gledajući dobnu skupinu između 35 i 44 godine, nalazimo se na dnu tablice, sa samo 64% osoba s razvijenim digitalnim vještinama.

3.2. Digitalizacija hrvatskih građana

U Hrvatskoj je, kao i u cijelom svijetu COVID-19 bio katalizator za digitalnu transformaciju građana. Tako uz online obrazovanje koje je postalo sastavni dio života osnovnoškolaca, ali i najnaprednijeg dijela društva starosti od 16-24 godine, počele su se koristiti i druge digitalne usluge u starijim kategorijama.

Tako je vrlo kratkom roku postalo sasvim normalno komuniciranje e-mailom, Web pretraživanje – googlanje, rad na daljinu, telekonferencije,

¹⁸ Indeks gospodarske i društvene digitalizacije (DESI) za 2020, za Hrvatsku, str. 2.

¹⁹ <https://ec.europa.eu/eurostat/en/web/products-eurostat-news/-/EDN-20200715-1?fbclid=IwAR1PZaArSQK9IAB1Q8JpyGw39zO2t6vMfsSW5bKka94VYJjiuEU1xRvZJI>, (pristupljeno 25.11.2021.)

E-trgovina, E naručivanje. U korištenju nekih javnih servisa kao što je E-građani, vidi se značajan porast u zadnje dvije pandemijske godine.

3.3. Utjecaj covid-19 na digitalnu transformaciju zdravstva

COVID-19 i digitalna revolucija imaju puno toga zajedničkog. Čak se može reći da su jako povezani. Kako je digitalna revolucija u kratkom vremenu transformirala naše društvo tako je i COVID-19 transformirao naše živote. Digitalna revolucija nije prva revolucija, tako ni COVID-19 nije prva pandemija. Međutim, proširila se brže nego digitalizacija.

Za razliku od “španjolske gripe” iz 1918. godine, kojoj je trebalo godinu dana da postane pandemija, COVID-19 se proširio na sve kontinente za samo nekoliko tjedana.²⁰

S takvim brzim širenjem epidemija je natjerala društvo u cjelini da se transformira i napravi nagle prelaskе na videokonferencije, rad na daljinu i druga digitalna rješenja. Međutim, zdravstveni sustav još uvijek upravlja krizom kroz rizične odlaske liječniku.

4. ZAKLJUČAK

Digitalna transformacija pozitivan je utjecaj, ali i velika pomoć zdravstvu i zdravstvenom sustavu. Telemedicina, umjetna inteligencija, Big data, elektronički zdravstveni karton i druge usluge u potpunosti mogu promijeniti zdravstveni sustav i način pružanja zdravstvene skrbi.

Bilo koja inovacija, pa tako i digitalna transformacija, za cilj ima s jedne strane optimizaciju sustava, pomoć liječnicima, smanjenje ljudske pogreške i troškova. S druge strane omogućuje bolju uslugu pacijentima što znači bolje ishode liječenja. Na žalost, zdravstvo zaostaje za drugim granama u implementaciji digitalnih strategija.

William Shedd filozof iz 19. st., konstatirao je: „Brod u luci je siguran, ali brodovi nisu za to napravljeni“. Tako je i s tehnologijama visokog potencijala odnosno digitalnom transformacijom koja je puna mogućnosti, ali beznačajna, ako poput broda ne „zaplovi“ zdravstvenim sustavom.

²⁰ Sirina Keesara, Andrea Jonas, Kevin Schulman, “Covid-19 and Health Care’s Digital Revolution”, https://www.nejm.org/doi/10.1056/NEJMp2005835#article_citing_articles, (pristupljeno 27.11. 2021.)

Abstract

DIGITAL HEALTH SYSTEM TRANSFORMATION

We are witnessing how digitalization, digital transformation, or revolution 4.0, is entering all the pores of our society. In the public sector, and one of its important components, health care, the Republic of Croatia is not reacting fast enough or better said keeping up with the leading countries of Europe and the rest of the World. Although our country was using digital services even before the COVID crisis, for example E-referral, E-prescription, it was still at the very beginning of the digital transformation. The COVID-19 pandemic and epidemiological measures have led to faster use of available innovations whose main goals are simplifying physicians work, system optimization, improving patient treatment outcomes, reducing human error while reducing costs. Readiness of citizens and medical personnel for changes brought by digital healthcare are an important link in the digital transformation of healthcare. This paper points out the necessity and advantages that digital transformation of the health care system is offering in order to improve the health care service, increase the efficiency of the health care system and provide better health care to the population during the global crises such as coronavirus pandemic.

Key words: health system, digitalization, digital transformtion.

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**ULOGA NORME ISO 10017:2021 – UPRAVLJANJE
KVALITETOM – SMJERNICE O STATISTIČKIM
TEHNIKAMA ZA ISO 9001:2015
U NABAVNOM POSLOVANJU**

THE ROLE OF ISO 10017: 2021 - QUALITY MANAGEMENT –
GUIDELINES ON STATISTICAL TECHNIQUES FOR ISO 9001: 2015
IN PURCHASING OPERATIONS

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SAŽETAK

Nabava se u prošlosti bavila uglavnom administrativnim poslovima naručivanja i reklamiranja nedostataka isporučene robe te skladištenja i izdavanja materijala prema zahtjevima korisnika. Za uspješno funkcioniranje organizacije potrebno je nabavno poslovanje ustrojiti u skladu sa zahtjevima upravljanja kvalitetom odnosno u skladu sa zahtjevima norme 9001. Iz tog razloga je u ovom radu prvo pojašnjena nabava te je izvršen pregled zahtjeva norme ISO 9001 u dijelu koji se odnosi na nabavno poslovanje te su uzete u obzir smjernice koje se preporučaju za implemen-

taciju tog djela norme (9002) kao i alate za poboljšanje implementiranih zahtjeva (9004). Nakon toga je dat posebni osvrt na statističke metode i tehnike koje se koriste (10007) za što uspješniju i svrsishodnu implementaciju zahtjeva norme ISO 9001 u nabavno poslovanje. Pregled statističkih alata i metoda danih u normi ISO 10017 ukazuje na potrebu njihove primjene u procesu nabave kako bi se osiguralo poboljšanje sustava i poslovanja što je jedno od temeljnih načela upravljanja kvalitetom.

Ključne riječi: nabava, nabavno poslovanje, ISO 9000, ISO 9001, ISO 9002, ISO 9004, ISO 10017, statističke tehnike.

1. UVOD

Nabava kao predvodnica svih aktivnosti u opskrbi organizacije vezano uz uspješnost procesa realizacije proizvoda i usluge u organizaciji ima značajnu ulogu i u sustavima upravljanja kvalitetom. Osim toga nabavna funkcija vezana je uz sve dobavljače u organizaciji, pa je zbog svega toga i posebno uključena u normama razreda 9. Uz to u procesu nabave pojavljuju se i zahtjevi za kontrolom kvalitete robe, dobavljača, ali i analizom cjelokupnog procesa nabave. Iz tog razloga važno je primjenjivati alate i statističke postupke koji su dani u normi ISO 10017. U ovom radu daje se pregled osnovnih pojmovnih aspekata nabave, zahtjeva za inkorporaciju nabave u norme iz područja upravljanja kvalitetom uz poseban osvrt na preporuke norme ISO 10017 vezane uz statističke metode i tehnike koje se koriste u funkciji poboljšanja kvalitete s posebnim naglaskom na nabavu i nabavno poslovanje.

2. NABAVA

Nabava se u prošlosti bavila uglavnom administrativnim poslovima naručivanja i reklamiranja nedostataka isporučene robe te skladištenja i izdavanja materijala prema zahtjevima korisnika. Danas je nabava sve manje funkcija s taktičkim zadacima u svezi s izvršenjem zahtjeva za nabavu uz niske nabavne cijene. Ona sve više postaje strategijska funkcija, koja svoje odluke temelji na filozofiji i politici stvaranja vrijednosti i sniženja ukupnih troškova u lancu opskrbe. Kao djelatnost je izuzetno složena i značajna za uspješnost poslovanja poduzeća.¹ B. Knežević navodi: „Nabava je nabav-

¹ Vilim Ferišak, *Nabava: Politika – Strategija – Organizacija – ManagementM*, II. aktualizirano i dopunjeno izdanje, Vlastita naklada, Zagreb, 2006.

ljanje materijala ili usluga, odgovarajuće kvalitete iz odgovarajućeg izvora, te njihova pravovremena dostava na odgovarajuće mjesto uz odgovarajuću cijenu.“² D. Miočević navodi da se: „Nabava smatra funkcijom koja dodaje vrijednost te je u velikoj mjeri zaslužna za poslovnu uspješnost. Nabava kao takva ima zadatak opskrbe vrijednostima koje će biti od važnosti kupcima te ona predstavlja čvorište u opskrbnom lancu kroz koje se odvija protok vrijednosti od izvornog dobavljača do krajnjeg kupca.“³ Za uspješno funkcioniranje organizacije potrebno je nabavno poslovanje ustrojiti u skladu sa zahtjevima upravljanja kvalitetom odnosno u skladu sa zahtjevima norme 9001, te je iz tog razloga u nastavku članka dato pojašnjenje o svim bitnim zahtjevima norme 9001 i pretećih normi kojima se nastoji poboljšavati proces upravljanja kvalitetom u nabavnom poslovanju.

3. NORME I NORMIZACIJA SUSTAVA UPRAVLJANJA KVALITETOM

Najpopularnija i najprodavanija obitelj normi, ISO 9000ff (ff – eng. full family) prvi je put objavljena 1987. godine nastavši kao rezultat višegodišnjeg rada tehničkog odbora ISO TC 176. U užu obitelj ISO 9000 pripadaju sljedeće norme: norma ISO 9000:2015 naziva *Sustavi upravljanja kvalitetom – Temeljna načela i terminološki rječnik*. U ovoj su normi dani osnovni pojmovi, načela i rječnik sustava upravljanja kvalitetom, a norma pruža osnovu za ostale norme za sustave upravljanja kvalitetom.⁴ Norma ISO 9001:2015 naziva *Sustavi upravljanja kvalitetom – Zahtjevi* određuje zahtjeve sustava upravljanja kvalitetom kojima se može koristiti za potrebe unutar organizacije, za certifikaciju ili za ugovorne svrhe te se usredotočuje na učinkovitost u ispunjavanju zahtjeva kupca i to je jedina norma u obitelji prema kojoj se može provoditi postupak certificiranja od treće strane.⁵ Norma ISO 9002:2016 naziva *Tehnička specifikacija za primjenu norme ISO 9001:2015*. Norma ISO 9004:2009 naziva *Pristup upravljanju kvalitetom – Upravljanje u*

² Blaženka Knežević, *Temeljni pojmovi, značenje i povijesni razvoj nabave u kontekstu lanca opskrbe*, Sveučilište u Zagrebu, Ekonomski fakultet, Zagreb, 2015.

³ Dario Miočević, „Upravljanje odnosima s ključnim dobavljačima na primjeru velikih i srednjih hrvatskih prerađivačkih poduzeća“, raspoloživo na: <http://hrcak.srce.hr/74450>, pristup 17. studeni 2021.

⁴ Norma HR EN ISO 9000:2015 *Sustavi upravljanja kvalitetom – Temeljna načela i terminološki rječnik*, HZN, 2015.

⁵ ISO 9001:2015 – What are the main changes, <http://ukcerti.co.uk/ISO-9001-2015.php>, pristup: 1. prosinca 2021.

svrhu trajne uspješnosti organizacije služi organizacijama kao uputa i podrška za postizanje održivog uspjeha pristupom upravljanja kvalitetom.⁶

3.1. ISO 9001:2015 Sustavi upravljanja kvalitetom – Zahtjevi

Norma ISO 9001 definira minimalne zahtjeve za sustav upravljanja kvalitetom s ciljem da organizacije koje ga primjenjuju svojim kupcima budu u mogućnosti ponuditi proizvode i usluge koji će biti u skladu s njihovim zahtjevima i s propisima koje definira pravni okvir u kojem djeluju. Prihvaćanje ove norme u organizaciji strateška je odluka njenoga vodstva. Svrha provedbe nije isključivo na kvaliteti koja vodi povećanju zadovoljstva kupaca već pomaže i unapređenju efikasnosti i učinkovitosti svih procesa kao i uvođenju pristupa neprekidnog poboljšavanja.⁷

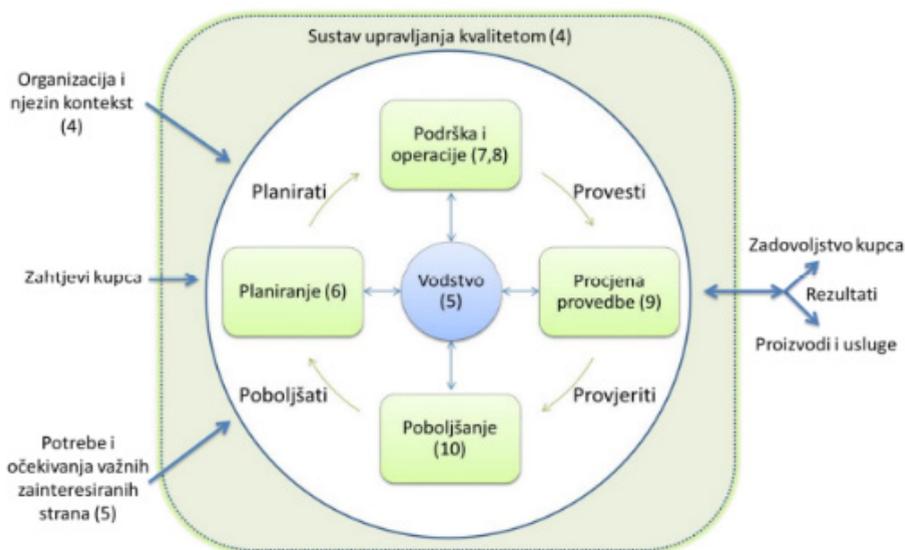
3.2. PDCA načelo

Sustav upravljanja kvalitetom sukladno sa zahtjevima norme ISO 9001 počiva na PDCA načelu. Skraćenica dolazi od engleskih riječi „Plan – Do – Check – Act“ (Planirati – Provesti – Provjeriti – Poboľjšati).

⁶ Zrinko Cindrić, *Zahtjevi za implementaciju sustava upravljanja kvalitetom prema nacrtu nove norme ISO 9001:2015*, Veleučilište u Karlovcu, Karlovac, 2015.

⁷ Rajka Sickinger-Nagorni, Jana Schwanke, *The New ISO 9001:2015, Its oppotrunities and challenges*, Sveučilište primjenjenih znanosti Tampere, Finska, 2016.

Slika 1. Struktura međunarodne norme ISO 9001 s PDCA krugom



Izvor: Norma ISO 9001:2015.

Načelo je postao dijelom norme ISO 9001 od revizije iz 2000. godine i od tada se njegov značaj u okviru zahtjeva sustava povećava.⁸ PDCA krug kontinuirana je petlja planiranja, provedbe, provjere ili proučavanja i poboljšavanja.⁹ Što se tiče norme ISO 9001:2015, cijela njezina struktura može se smjestiti u odgovarajuće dijelove PDCA kruga. Dijagram koji slijedi ilustrira osnovnu ideju norme ISO 9001:2015 u sklopu PDCA kruga i pojašnjava značajnu ulogu kupaca i interakciju pojedinih procesa unutar sustava upravljanja kvalitetom. Brojevi u zagradama predstavljaju odgovarajuća poglavlja iz norme.

3.3. Sedam načela upravljanja kvalitetom

Norma ISO 9001 temelji se na sedam načela upravljanja kvalitetom koja su definirana u normama ISO 9000 i ISO 9004. Norma ISO 9000:2015 za svako od sedam načela navodi polazište, obrazloženje zašto mu se organizacija treba posvetiti, ključne prednosti koje njegovo poštivanje donosi i moguće aktivnosti koje organizacija može poduzeti da bi uspješno primijenila načelo. U nastavku

⁸ Ibid.

⁹ Katarina Gaži-Pavelić, „PDCA: ISO 9001:2008 principi i zahtjevi u praksi,“ Zbornik radova 13. Hrvatske konferencija o kvaliteti, Hrvatsko društvo za kvalitetu, Brijuni, 2013.

slijedi lista svih sedam načela:¹⁰ Usmjerenost na kupca; Vodstvo; Uključenost ljudi; Procesni pristup; Poboljšavanje; Donošenje odluka na temelju činjenica; Upravljanje odnosima – upravljanje odnosima sa svim zainteresiranim stranama.

3.4. Upravljanje rizicima

Norma ISO 9001:2015 ne sadrži eksplicite zahtjev za upravljanje rizicima, već zahtjev za uzimanje u obzir rizika i prilika. Organizacija može samostalno odabrati metode i alate koji odgovaraju njejoj potrebi.^{11,12} S obzirom da je upravljanje rizicima unutar norme ISO 9001:2015 dosta nedorečeno i nekonzistentno kako bi se to prevladalo za što bolju implementaciju zahtjeva za uzimanje u obzir rizika i prilika potrebno je koristiti normu *ISO 9002:2016 – Smjernice za implementaciju zahtjeva iz ISO 9001:2015* norme ili normu ISO 31000 kojom se definira generički proces upravljanja rizicima za sva područja primjene.¹³ Aktivnosti sustava upravljanja kvalitetom koje treba poduzeti za uspješno upravljanje i rješavanje rizika su¹⁴ Identifikacija rizika; Analiza i ocjena rizika; Planiranje aktivnosti za smanjenje rizika i Provedba planiranih aktivnosti i sagledavanje preostalog rizika.

U kontekstu izrade ovog rada potrebno je dužnu pažnju posvetiti upravljanju rizikom u nabavi, čiji je cilj utvrditi moguća područja rizika i provesti odgovarajuće radnje kojima bi suzbile taj rizik. Sukladno tome, upravljanje rizikom u nabavi se može definirati kao identifikacija i upravljanje rizikom unutar nabave kao i vanjskim rizicima, kroz koordinirani pristup između članova lanca nabave s ciljem smanjenja ranjivosti lanca nabave kao jedne cjeline. Glavno područje rizika upravljanja lancem nabave smatra se raskrižjem između menadžmenta lanca nabave i upravljanja rizikom. Glavni ciljevi kod upravljanja rizicima u lancu nabave su: održavanje lanca nabave i kontinuirana dostupnost proizvoda, povećati sposobnosti lanca nabave kako bi se mogao nositi s poremećajima ako je to potrebno, izbjeci moguće domino efekte kroz lanac i postići da lanac nabave bude otporniji na smetnje.¹⁵

¹⁰ Norma HR EN ISO 9000:2015 Sustavi upravljanja kvalitetom – Temeljna načela i terminološki rječnik, HZN, 2015.

¹¹ Ibid.

¹² Katarina Gaži-Pavelić, „PDCA: ISO 9001:2008 principi i zahtjevi u praksi,“ Zbornik radova 13. Hrvatske konferencija o kvaliteti, Hrvatsko društvo za kvalitetu, Brijuni, 2013.

¹³ ISO 9001:2015 – rizici i prilike, <https://www.kvalis.com/iso-90012015-rizici-prilike/>, pristupio: 18. studenoga 2021.

¹⁴ Franjo Potak, „Upravljanje rizicima – Održivi razvoj i upravljanje rizicima,“ Zbornik radova 13. Hrvatske konferencije o kvaliteti, Hrvatsko društvo za kvalitetu, Brijuni, 2013.

¹⁵ Stefan Seuring, Martin Müller, Maria Goldbach, Uwe Schneidewind, “Strategy and Organization in Supply Chains”, 2003

4. ZAHTJEVI VEZANI UZ NABAVU UKLJUČENI U NORMAMA ZA SUSTAVE UPRAVLJANJA KVALITETOM

U normi ISO 9001:2015¹⁶ na nabavno poslovanje odnose se slijedeći zahtjevi (točke): 8.4 Nadzor procesa, proizvoda i usluga ostvarenih izvan organizacije; 8.4.1 Općenito; 8.4.2 Vrsta i opseg nadzora; 8.4.3 Informacije za vanjske pružatelje usluga i 8.6 Predaja proizvoda i usluge.

Zahtjevi pod brojevima 8.4; 8.4.1. i 8.4.2. odnose se na Proces nabave; zahtjev 8.4.3. se na Informacije za nabavu, a zahtjevi 8.4.2; 8.4.3 i 8.6 na Verifikaciju nabavljenog proizvoda.

4.1. Norma ISO 9002:2016

Za uspješnu implementaciju navedenih zahtjeva norme ISO 9001:2015 u organizaciju koja se bavi između ostalog i nabavnim poslovanjem dane su smjernice u normi ISO 9002:¹⁷

- **Za zahtjev 8.4.1.** su dane smjernice vezano za osiguravanje upravljanja procesima, proizvodima i uslugama koje pružaju vanjski dobavljači. Vanjski dobavljači mogu se smatrati korporativnim sjedištem organizacije, povezanim tvrtkama, dobavljačima ili nekim od kojih organizacija osigurava procese outsourcinga. Organizacija je odgovorna za osiguravanje da su procesi, proizvodi i usluge nabavljeni izvana u skladu sa zahtjevima (npr. kontrolom robe pri primitku ili nadzorom vanjskog pružatelja usluga). Organizacija treba odrediti:
 - a) koji interni procesi su u interakciji s procesima koji se pružaju izvana i kakav učinak ova nabava ima na operativni učinak;
 - b) koji materijali, komponente ili usluge nabavljeni izvana čine dio konačnog proizvoda ili usluge ili su kritični za pružanje proizvoda ili usluge;
 - c) zahtjevi i posebno upravljanje koje se primjenjuje za vanjsku nabavu, ovisno o učinku koji mogu imati na provedbu operativnih aktivnosti i učinak organizacije.

Na primjer, organizacija može zahtijevati: da su sirovine u skladu s tehničkim specifikacijama koje su provjerene pregledom ili ispitivanjem; da poslove održavanja, koje se obavljaju od partnerske

¹⁶ http://wqc-portal.pwa.co.th/attachment/topic/88/ISO_9001_2015.pdf, pristupljeno 5.12.2021.

¹⁷ <https://nobelcert.com/DataFiles/FreeUpload/ISO%20TS%209002-2016.pdf>, pristupljeno 5.12.2021.

tvrtke, obavljaju osobe s utvrđenom osposobljenošću uz korištenje propisane zaštitne opreme; da povezana tvrtka (kao što je sestrińska tvornica koja osigurava komponente za montažu) provodi provjere. Organizacija treba odrediti i primijeniti kriterije za ocjenjivanje, odabir, praćenje učinka i ponovnu evaluaciju vanjskih dobavljača. Primjena takvog procesa omogućuje organizaciji da jasno razumije trenutne sposobnosti vanjskih dobavljača, da identificira razlike između svojih potreba i njihovih sposobnosti te da identificira načine rješavanja ovih problema. U situacijama kada matično poduzeće ili korisnik zahtijeva određenog vanjskog dobavljača, to bi mogao biti utvrđeni kriterij, međutim, praćenje učinka je i dalje potrebno za sve vrste vanjskih dobavljača.

- **Za zahtjev 8.4.2.** pod nazivom Vrsta i opseg nadzora, dane su smjernice da ova točka predviđa uspostavljanje menadžmenta za vanjske dobavljače, kako bi organizacija imala povjerenje da će pruženi proizvodi i usluge zadovoljiti zahtjeve. Vrsta i opseg upravljanja temelje se na potencijalnom utjecaju koji procesi, proizvodi i usluge koji se pružaju izvana mogu imati na sposobnost organizacije da dosljedno isporučuje proizvode i usluge usklađene s pravilima. Organizacija bi trebala odrediti koje upravljanje treba primijeniti od strane vanjskog dobavljača ili za koje se oni trebaju prijaviti njemu. Ovo upravljanje osmišljeno je kako bi se osiguralo da se opskrba proizvoda ili usluge provodi u skladu s planiranim aranžmanima i da su proizvod i usluga u skladu sa zahtjevima. Potrebno je da organizacija osigura da procesi koje pruža vanjski dobavljač, a koji su unutar upravljanja sustavom upravljanja kvalitetom organizacije, ispunjavaju primjenjive zahtjeve ISO 9001.

Primjeri upravljanja uključuju, ali nisu ograničeni na, sljedeće:

- a) za vanjski pozivni centar, osposobljenost osoba koje preuzimaju pozive i postavljaju informacijsko-komunikacijski sustav na početku smjene;
- b) za isporučeni proizvod, ispitivanje prihvatljivosti od strane kvalificiranog inspektora ili ispitivanje na uzorku u laboratoriju organizacije;
- c) za usluge čišćenja hotelskih ili uredskih WC-a, kontrolni popis koji se koristi za provjeru da su sve planirane aktivnosti provedene.

Aktivnosti provjere koje bi se mogle razmotriti uključuju, ali nisu ograničene na, sljedeće: Kontrola prijema (npr. kontrola zaliha za

ured može biti jednostavna provjera da je naručena količina isporučena, pri čemu bi napomena s adresom dostave koju je potpisao zaposlenik mogla sadržavati sve dokumentirane podatke); pregled potvrda o analizama; provjeriti preko druge strane; ispitivanja (npr. organizacija može odlučiti kontrolirati uzorak serije ili izvršiti neki oblik ispitivanja kako bi potvrdila usklađenost sa zahtjevima; alternativno, moglo bi biti jednako učinkovito i učinkovito pregledati potvrde o analizama ili rezultate ispitivanja koje su dali vanjski dobavljači); evaluacija statističkih podataka; evaluacija pokazatelja uspješnosti.

- **Za zahtjev 8.4.3.** pod nazivom Informacije za vanjske pružatelje usluga dane su smjernice da ova točka ima za cilj osigurati da organizacija jasno komunicira vanjskim dobavljačima zahtjeve i upravljanje koje joj je potrebno za eksterno pružene procese, proizvode i usluge, kako bi se izbjegli negativni učinci na provedbu operativnih aktivnosti ili zadovoljstvo kupaca. Organizacija treba osigurati da su njezini zahtjevi potpuni, jasni i da se pozabave svim potencijalnim izvorima nejasnoća ili zbrke; obje strane trebale bi se složiti oko onoga što je potrebno. Bitno je da svi bitni detalji u trenutku narudžbe budu jasno navedeni. To može uključivati, na primjer, crteže, kataloge, brojeve modela, vrijeme odgovora i traženi datum i mjesto isporuke. Informacije dostavljene vanjskom dobavljaču (npr. pisana narudžbenica) treba provjeriti prije izdavanja. U malim organizacijama, osoba koja kupuje vjerojatno će biti ta koja provjerava adekvatnost. To bi moglo biti jednostavno kao čitanje i potvrda narudžbe putem telefona. Informacije o nabavi trebale bi sadržavati pojedinosti o svim metodama, procesima i opremi koja će se koristiti, npr. određene tehnike zavarivanja, korištenje specifične kalibrirane opreme ili uniforme zaposlenika. Drugi čimbenici koji se moraju jasno navesti mogu se odnositi na, npr., pakiranje, označavanje, potvrde o analizi ili rezultate ispitivanja. Iako je bitno u potpunosti opisati ono što je potrebno, nepotrebni detalji mogu dovesti do nesporazuma i zaliha. Informacije bi trebale specificirati sve zahtjeve sposobnosti koje vanjski dobavljač mora imati, kao što je certificirani zavarivač ili kvalificirani odvjetnik. Zahtjevi o tome kako bi vanjski dobavljač trebao komunicirati s organizacijom, kao npr. treba uključiti sastanke planirane za pregled napretka ili utvrđivanje tko će biti zadužen za kontakt u organizaciji. Potrebno je pratiti učinak vanjskih dobavljača. Vrsta i učestalost praćenja koje će

organizacije koristiti trebaju biti uključene u informacije. To bi moglo odrediti razinu izvedbe koju vanjski dobavljač mora ispuniti ili pružiti informacije o tome kako će se priopćavati rezultati evaluacija učinka koje su izvršile organizacije. Povremeno će organizacija ili njezin korisnik morati izvršiti provjeru ili provjeru valjanosti na mjestu vanjskog dobavljača. To može biti zbog veličine proizvoda, prirode usluge ili zbog vremenskih ograničenja za isporuku.

- **Za zahtjev 8.6. pod** nazivom Predaja proizvoda i usluge dane su smjernice da ova točka ima za cilj osigurati da proizvodi i usluge budu u skladu sa svim primjenjivim zahtjevima, prije nego što se isporuče korisniku. Organizacija treba dobiti odobrenje od relevantnog tijela kada planirani aranžmani nisu ispunjeni; u nekim slučajevima to tijelo može biti korisnik. Organizacija bi trebala razmotriti uspostavljanje kriterija za situacije u kojima je potrebno dobiti odobrenje korisnika. U tim slučajevima mogu se primijeniti zahtjevi za nesukladne izlazne elemente. Osobu(e) koja(e) odobrava(ju) konačno izdavanje proizvoda ili usluge treba na odgovarajući način definirati, npr., kroz opis posla ili razinu ovlasti te treba osigurati sljedivost. To se može postići pohranjivanjem dokumentiranih informacija kao npr.: imati potpis ovlaštene osobe; detaljno opisati sveobuhvatnu autorizaciju za automatsko puštanje proizvoda u promet nakon ispunjavanja određenih kriterija (npr. ovlaštenje za automatsko elektroničko plaćanje za „online“ prodaju)

4.2. Norma 9001:2015

Nakon analize smjernica danih u normi ISO 9002 za uspješnu primjenu zahtjeva norme ISO 9001 na nabavno poslovanje u ovom radu analiziraju se zahtjevi norme ISO 9001 u dijelu koji se odnosi na nabavno poslovanje i to kako slijedi:¹⁸

8.4. Nadzor procesa, proizvoda i usluga ostvarenih izvan organizacije, obuhvaća sve oblike vanjske nabave, bilo da se kupuje od dobavljača, kroz podugovaranje (eng. outsourcing) procesa, dogovor sa suradničkom organizacijom ili na neki drugi način. Norma zahtijeva od organizacija da utvrde određene kriterije za praćenje rada vanjskih pružatelja usluga i da zadrže dokumentirane informacije o rezultatima vrednovanja rada. Organizacija mora imati:

¹⁸ http://wqc-portal.pwa.co.th/attachment/topic/88/ISO_9001_2015.pdf, pristupljeno 5.12.2021.

- uspostavljene kriterije kojima će vrednovati, pratiti i ponovno procijeniti rad vanjskih pružatelja usluga,
- sačuvane dokumentirane informacije vezane uz rezultate ovog vrednovanja, praćenja i ponovne procjene.

8.4.2. Vrsta i opseg nadzora – ova podtočka zahtijeva analizu kako vanjski pružatelji usluga utječu na uspjeh organizacije i što ona namjerava poduzeti u vezi s tim. Temeljni zahtjev kaže da vanjski pružatelji usluga ne smiju negativno utjecati na sposobnost isporuke sukladnih proizvoda. On se proširuje sljedećim zahtjevima:

- osigurati nadzor unutar sustava upravljanja kvalitetom – norma zahtijeva da nabava ostane pod nadzorom sustava upravljanja kvalitetom.
- odrediti nadzore koji se primjenjuju na vanjske pružatelje usluga i rezultirajuće izlazne podatke – prvi nadzor koji je usredotočen na samog vanjskog pružatelja usluga zahtijeva njegovu provjeru, utvrđivanje ciljeva za izvedbu i praćenje odaziva. Druga polovica zahtijeva fokusira se na ono što pruža vanjski pružatelj usluga, pregled proizvoda, testiranje i ispitivanje kupaca.
- razmotriti učinak na kupce i propisane i zakonske zahtjeve – ovaj učinak trebao bi biti dio proračuna koji se koristi pri određivanju nadzora. Primjerice, ako dobavljač ima direktan kontakt s kupcima organizacije ili ima sposobnost utjecaja na zakonodavne organe za sigurno da će zavrijediti povećan nadzor.

8.4.3. Informacije za vanjske pružatelje usluga – prije priopćavanja zahtijeva vanjskim pružateljima usluga organizacija mora osigurati njihovu prikladnost. Organizacije su vanjskim pružateljima usluga dužne dati informacije o:

- međudjelovanju sa sustavom upravljanja kvalitetom organizacije,
- načinu kako će organizacija nadzirati i pratiti njihovu izvedbu.

Dodan je novi zahtjev da organizacije moraju priopćiti vanjskim pružateljima usluga zahtjeve za osposobljenošću njihovog osoblja.

8.6. Aktivnosti poslije isporuke – aktivnosti poslije isporuke u novoj su normi detaljnije razrađene pošto mogu imati snažan utjecaj na odanost kupca. Kod određivanja opsega aktivnosti poslije isporuke organizacija mora uzeti u obzir:

- propisane i zakonske zahtjeve – relativno su rijetki propisani i zakonski zahtjevi koji daju neke zahtjeve s obzirom na aktivnosti poslije isporuke. Međutim, ukoliko postoje organizacija ih je dužna poštivati.
- moguće probleme – primjerice, ukoliko organizacija isporučuje proizvode koje kupci mogu upotrijebiti na neprikladan način dužna je poduzeti sve radnje kako bi se osigurala adekvatna pomoć i spriječilo neželjene posljedice.
- primjenu i vijek trajanja – organizacija mora ostati u kontaktu s kupcima kako bi pratila životni vijek proizvoda i bilježila moguće prilike za poboljšanja ili pomoć kupcima,
- zahtjeve kupca – ovaj zahtjev može uključivati ugovor s kupcem o redovitom preventivnom održavanju isporučenog stroja. Takvi se zahtjevi obično navode već prilikom narudžbe proizvoda.
- povratne informacije kupca – na ovaj način organizacija može saznati brojne korisne informacije o svojim proizvodima i uslugama i ubuduće na temelju njih pristupati projektiranju i razvoju novih proizvoda.

4.3. Norma 9004:2018

Kako bi nabavno poslovanje u organizaciji funkcioniralo na najvišoj mogućoj razini u skladu sa sustavom upravljanja kvalitetom predviđenom u naprijed navedenim zahtjevima norme ISO 9001 potrebno je koristiti smjernice predviđene u normi 9004¹⁹ pod nazivom Smjernice za postizanje trajnog uspjeha:

- **Za učinkovito i djelotvorno upravljanje svojim procesima, organizacija bi trebala:**
 - upravljati procesima i njihovim interakcijama, uključujući eksterno osigurane procese, kao sustav poboljšati usklađivanje / povezivanje između procesa;
 - vizualizirati mrežu procesa, njihov slijed i interakcije u grafičkom prikazu (npr. karta procesa, dijagrami) kako bi se razumjele uloge svakog procesa u sustavu i njegovi učinci na izvedba sustava;
 - utvrditi kriterije za rezultate procesa, procijeniti sposobnost i performanse sustava procese uspoređujući rezultate s kriterijima i planirajte akcije za poboljšanje procesa kada ne postižu učinkovito rezultate koje očekuje sustav;

¹⁹ <http://parsetraining.com/wp-content/uploads/2018/07/ISO-9004-2018.pdf>, pristupljeno 5.12.2021.

- procijeniti rizike i mogućnosti povezane s procesima i provesti sve radnje koje su neophodne kako bi se spriječili, otkrili i ublažili neželjeni događaji, uključujući rizike kao što su: ljudski čimbenici (npr. nedostatak znanja i vještina, kršenje pravila, ljudske pogreške); neodgovarajuća sposobnost, propadanja i kvarovi opreme; neuspjeh u dizajnu i razvoju; neplanirane promjene u dolaznom materijalu i uslugama; nekontrolirane promjene u okolišu za rad procesa; neočekivane promjene u potrebama i očekivanjima zainteresiranih strana, uključujući tržište zahtijevajte;
- redovito pregledavati procese i njihove međusobne odnose i poduzimati prikladne radnje za kontrolu i poboljšanje, kako bi se osiguralo da oni i dalje budu učinkoviti i podržavaju održivi uspjeh organizacije.

4.4. Norma 10017:2021

Kako bi organizacija mogla na zadovoljavajući način razvijati, implementirati, održavati i poboljšavati sustav upravljanja kvalitetom općenito, a posebno u dijelu koji se odnosi na nabavno poslovanje, a sve u skladu s normom ISO 9001 potrebno je koristiti smjernice za odabir odgovarajućih statističkih tehnika naveden u normi ISO 10017.²⁰ Svrha norme ISO 10017, između ostalog, je i pomoći organizaciji u identificiranju statističkih tehnika u odnosu na elemente sustava upravljanja kvalitetom kako je definirano u ISO 9001:2015. Primjena takvih tehnika može donijeti značajne prednosti u kvaliteti, produktivnosti i troškovima. Ova norma daje smjernice za odabir odgovarajućih statističkih tehnika koje mogu biti korisne organizaciji, neovisno o veličini ili složenosti, u razvoju, implementaciji, održavanju i poboljšanju sustava upravljanja kvalitetom u skladu s ISO 9001:2015, ali ne daje smjernice o tome kako koristiti statističku tehniku. Statističke tehnike mogu pomoći u evaluaciji, kontroli i poboljšanju procesa i njihovih rezultata te pomoći u procjeni i poboljšanju učinkovitosti sustava upravljanja kvalitetom. Statističke tehnike ili obitelji tehnika koje se široko koriste i koje nalaze korisnu primjenu u implementaciji ISO 9001 uključuju: deskriptivnu statistiku; dizajn eksperimenata (DOE); testiranje hipoteze; analiza mjernog sustava (MSA); analiza sposobnosti procesa; regresijska analiza; analiza pouzdanosti; uzorkovanje; simulacija; statistička kontrola procesa (SPC); statistička tolerancija; analiza vremenskih serija. Mnoge od ovih tehnika koriste se zajedno s drugim tehnikama ili kao podskupovi drugih statističkih tehnika. Izbor teh-

²⁰ <https://bambangkesit.files.wordpress.com/2016/09/iso-1017-statistik.pdf>, pristupljeno 5.12.2021.

nike i način njezine primjene ovisit će o veličini i složenosti organizacije te potencijalnoj koristi za organizaciju.

Za potrebe ovog rada potrebno je pojasniti statističke tehnike koje se primjenjuju u normi ISO 9001 vezano za nabavno poslovanje, a radi se o:

- **Deskriptivnoj statistici** – pojam “deskriptivna statistika” odnosi se na širok raspon tehnika za sažimanje i karakterizaciju podataka. Obično je to početni korak u analizi kvantitativnih podataka, a često predstavlja prvi korak prema korištenju drugih statističkih tehnika.
- **Uzorkovanju** – uzorkovanje je statistička metodologija za procjenu informacija o nekim karakteristikama populacije proučavanjem reprezentativnog udjela (tj. uzorka) populacije. Postoje različite tehnike uzorkovanja koje se mogu upotrijebiti, kao što su jednostavno nasumično uzorkovanje, stratificirano uzorkovanje, sustavno uzorkovanje, sekvencijalno uzorkovanje i uzorkovanje s preskakanjem serije.
- **Analizi mjernog sustava** – analiza mjernog sustava (MSA), također poznata kao “analiza mjerne nesigurnosti”, skup je postupaka za procjenu nesigurnosti mjernih sustava u rasponu uvjeta u kojima sustav radi. Gdje god se prikupljaju podaci, potrebno je uzeti u obzir mjernu nesigurnost. Analiza mjernog sustava (MSA) se koristi za procjenu, uz propisanu razinu pouzdanosti, je li mjerni sustav prikladan za svoju namjenu.
- **Regresijskoj analizi** – regresijska analiza pomaže odrediti učinak različitih čimbenika (koji se obično nazivaju “objašnjavajuće” ili “nezavisne” varijable) na karakteristiku od interesa (obično nazvanu “odgovor” ili “ovisna” varijabla). Regresijska analiza omogućuje empirijski razvoj modela.
- **Analizi vremenskih serija** – vremenski niz je slijed promatranja poredanih u vremenu, a analiza takvih podataka naziva se “analiza vremenske serije”. Koristi se za opisivanje obrazaca u podacima o vremenskim serijama, za identifikaciju „odbojnih vrijednosti“ (tj. ekstremnih vrijednosti čiju valjanost treba istražiti) kako bi se lakše razumjeli uzorci ili prilagodbe procesa, te za otkrivanje prekretnica u trendu.
- **Dizajnu eksperimenata (DOE)** – može se koristiti za ocjenjivanje i/ili poboljšanje jedne ili više karakteristika proizvoda, usluge, procesa ili sustava kao što su nedostaci, prinos ili varijabilnost. DOE je osobito koristan za istraživanje složenih sustava na čiji ishod može utjecati potencijalno veliki broj čimbenika.

- **Testiranju hipoteza** – koristi se za određivanje (na navedenoj razini značajnosti) je li hipoteza koja se odnosi na parametar populacije istinita ili ne.
- **Analizi sposobnosti procesa** – uključuje mjerenje disperzije (ili širenja) parametra proizvoda u odnosu na raspon varijacija dopuštenih specifikacijama, kako bi se procijenila sposobnost procesa da zadovolji te specifikacije.
- **Analizi pouzdanosti** – primjena inženjerskih i analitičkih metoda za procjenu, predviđanje i osiguranje performansi bez problema tijekom vremena proizvoda ili sustava koji se proučava. Metode koje se koriste u analizi pouzdanosti često zahtijevaju korištenje statističkih tehnika za rješavanje nesigurnosti, slučajnih karakteristika ili vjerojatnosti pojave (kvarova, itd.) tijekom vremena.
- **Statističkoj kontroli procesa (SPC)** – odnosi se na korištenje procesnih podataka za praćenje, kontrolu, evaluaciju i poboljšanje procesa i rezultirajućeg proizvoda/usluge.
- **Statističkoj toleranciji** – odnosi se na postupak koji se temelji na statističkim načelima, koji se koristi za utvrđivanje tolerancije. Koristi se statističkim distribucijama relevantnih dimenzija pojedinačnih komponenti za određivanje ukupne tolerancije za sastavljene jedinice.

Od navedenih tehnika, koje su pokazale najbolje rezultate prilikom primjene norme ISO 9001 u dijelu koji se odnosi na nabavno poslovanje, u svakoj od točaka koriste se slijedeće tehnike:

- **za točku 8.4.1.** (općenito) uključeni su kvantitativni podaci koji se odnose na evaluaciju procesa, proizvoda i usluga koje se pružaju izvana te njihovih pružatelja, a statističke tehnike koje se koriste su Deskriptivna statistika i Uzorkovanje;
- **za točku 8.4.2.** (vrsta i opseg kontrole) uključeni su kvantitativni podaci koji se odnose na dolazne kontrolne podatke, a statističke tehnike koje se koriste su Deskriptivna statistika, Analiza mjernog sustava, Regresijska analiza, Uzorkovanje, Analiza vremenskih serija te su isto tako uključeni kvantitativni podaci koje se odnose na podatke o kontroli procesa vanjskog dobavljača, a statističke tehnike koje se koriste su Deskriptivna statistika, Dizajn eksperimenta, Testiranje hipoteza, Analiza mjernog sustava, Analiza sposobnosti procesa, Analiza pouzdanosti, Uzorkovanje, Statistička kontrola procesa, Statističke tolerancije i Analiza vremenskih serija;
- **za točku 8.4.3.** (Informacije za vanjske pružatelje usluga) statističke tehnike se ne primjenjuju;

- **za točku 8.6.** (Izdavanje proizvoda i usluga) uključeni su kvantitativni Podaci koji se odnose na dokazivanje sukladnosti sa zahtjevima, a statističke tehnike koje se koriste su Deskriptivna statistika, Testiranje hipoteza, Analiza pouzdanosti, Uzorkovanje, Statistička kontrola procesa.

5. ZAKLJUČAK

U cijelom procesu i funkciji nabave osobito važno je osiguranje efikasnosti i efektivnosti temeljnih procesa u organizaciji. Kako bi se to osiguralo ključno je uspješno upravljati procesom i funkcijom nabave i svim njenim elementima. Pregled statističkih alata i metoda danih u normi ISO 10017 ukazuje na potrebu njihove primjene u procesu nabave kako bi se osiguralo poboljšanje sustava i poslovanja što je jedno od temeljnih načela upravljanja kvalitetom. Cijeli razred 10 normi dizajniran je i objavljen s ciljem pomoći organizacijama da što bolje implementiraju i upravljaju na kvalitetan način dajući smjernice za poboljšanja sustava upravljanja kvalitetom.

Abstract:

THE ROLE OF ISO 10017:2021 - QUALITY MANAGEMENT – GUIDELINES ON STATISTICAL TECHNIQUES FOR ISO 9001:2015 IN PURCHASING OPERATIONS

In the past, procurement was mainly engaged in administrative tasks of ordering and advertising defects in delivered goods, as well as storage and issuance of materials according to customer requirements. For the successful functioning of the organization, it is necessary to organize procurement operations in accordance with the requirements of quality management, ie in accordance with the requirements of standard 9001. For this reason, this paper first clarifies procurement and reviews the requirements of ISO 9001 in the part related to procurement operations. and the guidelines recommended for the implementation of this part of the standard (9002) as well as the tools for improving the implemented requirements (9004) were taken into account. After that, a special review was given to the statistical methods and techniques used (10007) for the most successful and purposeful implementation of the ISO 9001 standard in procurement. An overview of statistical tools and methods given in the ISO 10017 standard indicates the need for their application in the procurement process to ensure the improvement of systems and operations, which is one of the basic principles of quality management.

Key words: procurement, purchasing operations, ISO 9000, ISO 9001, ISO 9002, ISO 9004, ISO 10017, statistical techniques.

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VAŽNOST INOVACIJA ZA AFIRMACIJU KVALITETE U UGOSTITELJSKIM OBJEKTIMA JEDNOSTAVNIH USLUGA¹

IMPORTANCE OF INNOVATION FOR QUALITY AFFIRMATION
IN HOSPITALITY INDUSTRY – SIMPLE SERVICE CATERING
FACILITIES

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SAŽETAK

Predmet rada su inovacije u objektima jednostavnih usluga usmjerene na postizanje nove kvalitete i konkurentnosti. Rad pojmovno određuje i predstavlja obilježja ugostiteljskih objekata jednostavnih usluga kao i važnost inovacija te se fokusira na inovacije u objektima jednostavnih usluga. Cilj i svrha rada je istražiti percepciju potrošača o važnosti unaprjeđenja kvalitete ugostiteljskih objekata jednostavnih usluga te doprinijeti unaprjeđenju ponude. Provedeno istraživanje kvalitativnom i kvantitativnom metodomologijom obrađuje stavove potrošača te predstavlja smjernice za konkurentnosti ugo-

¹ Rad je nastao kao nastavka istraživanja prezentiranih u Završnom radu *Inovacije u organizaciji objekata za pružanje jednostavnih ugostiteljskih usluga*, autorice Kristine Kukolj, uz mentorstvo doc. dr. sc. Tamare Floričić.

stitejskih objekata jednostavnih usluga. Rad predstavlja doprinos percepciji važnosti kvalitete specifičnih ugostiteljskih sadržaja koji u globalnom zamašnjaku razvoja.

Ključne riječi: ugostiteljstvo, objekti jednostavnih usluga, kvaliteta, inovacije, konkurentnost

1. UVOD

Inovacija je proces koji se odvija u nekoliko faza, a na čijem začelju stoji ideja. Razvojem ideja postaje prijedlog – ono u što će se investirati. Usvajanjem prijedloga ulaže se u realizaciju prvotne ideje te realizirana ideja dolazi na tržište kao inovacija. Umjetnost, kreativnost i poslovno upravljanje s ciljem pronalaska novog modela su ključni za inovativnost i konkurentnost, jer zahtjevno tržište podiže kriterije za sve one koji svoje ideje pretvaraju u uspješne komercijalne inovacije. Svakodnevnica, određene rutine i obrasci ipak ne čine poslovanje jednostavnim, stoga je potrebno traženje novih neobičajenih rješenja reorganizirajući percepciju, spoznajno iskustvo i opće prihvaćene društvene vrijednosti, jer upravo poticanje kreativnosti i slobodnog izražavanja potiče jačanje inovativnog potencijala poduzeća.

Ugostiteljski objekti jednostavnih usluga predstavljaju značajan segment ponude često organiziran u obliku mikro poduzetništva. Cilj i svrha rada je istražiti percepciju potrošača o važnosti unaprjeđenja kvalitete ugostiteljskih objekata jednostavnih usluga te doprinijeti unaprjeđenju ponude. Rad je podijeljen u tri poglavlja te počinje uvodom gdje se predstavlja problematika konkurentnosti ugostiteljskih objekata jednostavnih usluga. Prvo poglavlje teoretski predstavlja objekte, u drugom poglavlju predstavljaju se inovacije koje je moguće implementirati u ovaj specifični oblik ugostiteljskih objekata dok se u trećem poglavlju predstavlja istraživanje: metodologija i rezultati koje prati diskusija. Rad završava zaključnim razmatranjima.

2. TEORIJA I PREGLED LITERATURE – OBJEKTI JEDNOSTAVNIH USLUGA

Objekti jednostavnih usluga su ugostiteljski objekti koji čine posebnu vrstu obzirom na usluge koje se u njima pružaju. Skupina se diversificira na više vrsta, a karakteristike svake vrste jednostavnih ugostiteljskih objekata navode se u sljedećem potpoglavlju.

2.1. Pojmovno određenje objekata jednostavnih usluga

Pravilnik o razvrstavanju i minimalnim uvjetima ugostiteljskih objekata iz skupina restorani, barovi, „catering“ objekti i objekti jednostavnih usluga uz izmjene i dopune,² definira uvjete koje moraju ispunjavati ugostiteljski objekti iz navedenih skupina, te koje usluge mogu pružati. Ističu se vrste i obilježja objekata jednostavne usluge:

- *Objekt jednostavnih usluga u kiosku* – ugostiteljski objekt u kojem se mogu pripremati i usluživati jednostavna jela, pića i napici, te usluživati jednostavna jela u konfekcioniranom obliku, pića u originalnom pakovanju, te slastice i sladoled.
- *Objekt jednostavnih brzih usluga* – ugostiteljski objekt u kojem se mogu pripremati jednostavna jela koja se pripremaju i uslužuju na jednostavan i brz način, a koriste se za brzu konzumaciju i to: razne vrste *burgera*, topli i hladni sendviči, prženi krumpir i *hot dog*, a mogu se usluživati bezalkoholna pića i napici, te sladoled u originalnom pakovanju.
- *Objekt jednostavnih usluga u nepokretnom vozilu (ili priključnom vozilu)* – ugostiteljski objekt u kojem se mogu pripremati i usluživati jednostavna jela, pića i napici, usluživati jednostavna jela u konfekcioniranom obliku, pića u originalnom pakovanju, te slastice i sladoled.
- *Objekt jednostavnih usluga u šatoru* – ugostiteljski objekt u kojem se mogu pripremati i usluživati jednostavna jela, pića i napici, a mogu se usluživati jela u konfekcioniranom obliku i pića u originalnom pakovanju.
- *Objekt jednostavnih usluga na klupi* – ugostiteljski objekt u kojem se mogu pripremati i usluživati sljedeća jednostavna jela: topli i hladni sendviči, hrenovke, kobasice, *hot dog*, kotleti, čevapčići, ražnjići, *pommes frites*, palačinke i slična jela, te jednostavna jela u konfekcioniranom stanju i pića u originalnom pakovanju.
- *Objekt jednostavnih usluga na kolicima (ili sličnim napravama)* – ugostiteljski objekt u kojem se mogu pripremati i usluživati sljedeća jednostavna jela: *hot dog*, hrenovke, kobasice, palačinke i slična jela, te usluživati jednostavna jela u konfekcioniranom obliku.

² Ministarstvo turizma, prometa i razvitka Pravilnik o razvrstavanju i minimalnim uvjetima ugostiteljskih objekata iz skupina „Restorani“, „Barovi“, „Catering objekti“ i „Objekti jednostavnih usluga“. Zagreb, (NN 82/07; 75/12).

U objektima jednostavnih usluga se pripremaju i uslužuju različite vrste jednostavnih jela, pića, napitaka, kao i sladoleda, a samo usluživanje se vrši kroz otvore, u hodu ili na drugom mjestu. Karakteristično obilježje koje se odnosi na promatrane objekte je to da u objektima jednostavnih usluga opremaju samo s visokim stolovima bez stolica, a jela i pića uslužuju se s priborom za jednokratnu uporabu. Jela i napici mogu se usluživati u konfekcioniranom stanju te pića i sladoled u originalnom pakovanju. Ugostiteljski objekt može imati i lokacijski odvojene prostorije za usluživanje gostiju (dodatne prostorije za usluživanje) na udaljenosti do najviše 50 m od ugostiteljskog objekta.

2.2. Uvjeti koje moraju ispunjavati objekti jednostavnih usluga

Objekt jednostavnih usluga mora ispunjavati propisane minimalne uvjete za poslovanje, koji se prvenstveno odnose na prostor, odnosno njegovu veličinu u skladu s namjenom. Nadalje, objekti moraju imati jasno naznačeno obilježje, kao i to što moraju imati jelovnike s istaknutim cijenama na vidljivim mjestima, odnosno stolovima.

Uz navedeno Pravilnik³ nalaže ispunjavanje uvjeta prema vrstama objekta jednostavnih usluga diferencirano prema vrsti objekta. Zajednički uvjeti su: točionik, prostor za pripremanje jela u točioniku, priručni prostor za čuvanje hrane i pića, dovoljan broj koševa za otpatke s poklopcem za nožno otvaranje, a može imati i prostoriju za usluživanje s točionikom s ili bez visokih stolova bez stolaca.

3. INOVACIJE U OBJEKTIMA JEDNOSTAVNIH USLUGA

U ovom dijelu rada će se opisati potreba za inovacijama u objektima jednostavnih usluga, odnosno identificirat će se karakteristike i čimbenici koji utječu na potražnju za uslugama navedenih objekata, te potrebe za poboljšanjima u smislu inovacija.

Inovacija je pojam nastao od latinske riječi *innovatio* što znači stvaranje nečeg novog, a odnosi se na rast organizacije utemeljen na inovacijama. Inovacije su uslužnim djelatnostima uključujući i ugostiteljstvo bile dugo vremena zanemarene. Primjena tehnologije i usmjerenost na kupca ih intenzivira te mijenja dinamiku primjene u budućnosti. „Inovacije je moguće definirati kao proces stvaranja nove vrijednosti namijenjene prvenstveno potrošačima, ali i

³ Ibid.

drugim interesnim skupinama kao što su zaposlenici poduzeća, dioničari, te vanjski partneri.⁴

Iako se inovacije vežu s kreativnošću potrebno je naglasiti kako kreativnost nije istoznačnica inovacije. Klasifikacije inovacija su različite ovisno o kriterijima koji se promatraju i o kojoj djelatnosti se govori, a kada je riječ o podjeli inovacija u turizmu, onda se one diferenciraju na: inovacije na proizvodima, na poslovnim procesima, inovacije na području upravljanja informacijama, zatim na području menadžmenta i institucionalne inovacije.^{5,6}

Inovacije na poslovnim procesima se odnose na optimizaciju istih, odnosno smanjenje troškova na temelju primjene tehnoloških rješenja. U turizmu se navedeno odnosi na uvođenje HACCP sustava koji se donosi na standarde očuvanja, pripreme i posluživanja hrane. Uvođenjem HACCP sustava se pruža mogućnost brže pripreme hrane u boljim uvjetima te uz manje troškove. Kada je riječ o inovacijama na području upravljanja informacijama, navedeno se veže za razvoj informacijskih i komunikacijskih ICT tehnologija te njihovu implementaciju⁷ u suvremeno ugostiteljstvo i hotelske strukture.⁸ Inovacijama u ugostiteljstvu bavi se i Floričić⁹ gdje iste diferencira na inovacije: organizacije usluga, tematsko uređenje, posebno iskustvo, urbano – arhitektonska uređenja te inovativne tehnologije. Ističe kako, uz tržišne mehanizme ponude i potražnje, na inovacije u ugostiteljstvu utječe mikro i makro okruženje uključujući legislativni, financijski i edukativni aspekt te konkurencija. Nastavno, Carlborg et al.¹⁰ razmatraju niz inovacija koji se reflektiraju na kvalitetu usluživanja i same usluge, kao i Pirnar et al.¹¹ koji razmatraju „soft“ inovacije u uslužnom sektoru

⁴ Ratko Dobre, *Inovacije, tehnološke promjene i strategije*, Visoka škola za turistički menadžment, Šibenik, 2005.

⁵ Luiz Mouthino, *Strateški menadžment u turizmu*, Masmedia, Zagreb, 2005.

⁶ Jasna Prestar, *Menadžment inovacija*, Sinergija, Zagreb, 2010.

⁷ Andrew Grant, Gala Grant, *The Innovation Race: How to Change a Culture to Change the Game*, Wiley, New York, US, 2016.

⁸ Primitiva Pascual-Fernandez, Maria Leticia Santos-Vijande, José Ángel Lopez-Sanchez, Arturo Molina, „Key drivers of innovation capability in hotels: implications on performance“, *International journal of hospitality management*, Vol. 94, 2021.

⁹ Tamara Floričić, „Comprehension of innovative solution in hospitality industry, ESD 2016“, 18th International Scientific Conference on Economic and Social Development, *Building Resilient Society*, Vol. 12, No. 9-10, Zagreb, 2016, pp. 695-705.

¹⁰ Per Carlborg, Daniel Kindström, Christian Kowalkowski, „The evolution of service innovation research: a critical review and synthesis“, *The Service Industries Journal*, Vol. 34, No. 5, 2014, pp. 373-398.

¹¹ Ige Pirnar, Yasemin Celik Kamali, Engin Deniz Eris, „Soft innovation in hotel services: case of Izmir City, *International journal of tourism cities*, Vol. 6, Issue 4, 2020.

Inovacije na području menadžmenta se odnose na inovativne pristupe upravljanju ljudskim resursom. Cilj uvođenja inovacija na području menadžmenta je zadržavanje visokokvalificiranog osoblja, ali uz zadržavanje organizacijske fleksibilnosti. U publikaciji Instituta za turizam¹² stoji kako „osim toga, inovacije na području menadžmenta usmjerene su i ka podizanju sposobnosti menadžmenta turističkih poduzeća i organizacija da na primjeren način upravljaju često kompliciranim odnosima među različitim dionicima koji su uključeni u turistički razvoj (turisti, lokalno stanovništvo, turistička poduzeća i sl.).“Institucionalne inovacije se odnose na uvođenje novog zakonodavnog okvira koji omogućuju lakše turističko poslovanje. Primjeri inovativnosti u institucijama prema publikaciji Instituta za turizam su:¹³

- ugovori o franšizi koji omogućuju brzo širenje inovacija po cijelom svijetu uključujući poznate gastronomske brendove i organizacijske koncepte, McDonalds, Burger King, i druge;
- pojava organizacija koje promiču tzv. socijalni turizam čiji je glavni cilj približavanje turizma društveno najugroženijim skupinama;
- pojava kompanija za destinacijski menadžment (DMC), kao reakcija na sve veće zahtjeve organizatora poslovnih skupova za organizacijom specifičnih programa u destinaciji.

Sukladno navedenom može se zaključiti kako u današnje vrijeme kada tržište karakterizira konkurencija i brzorastuće industrije inovacije su ključan čimbenik za ostvarivanje kontinuiranog rasta. Industrija hrane i pića i dalje je podložna ogromnim promjenama zbog promjena potrošačkih preferencija, novih tehnologija i mjera prilagodbe etabliranih marki te usmjerenosti na zadovoljstvo gosta.¹⁴ Upravo zato se u nastavku prikazuju inovacije u objektima jednostavnih usluga koje se već primjenjuju i koje će biti/ dogoditi se prema prognozama za FMCG (eng. Fast Moving Consumer Goods).

- *Inovacije u kiosku* – Niz inovativnih kioska s hranom predstavlja revolucioniran način na koji potrošači pristupaju i konzumiraju hranu. U skladu s izrazito užurbanim životima suvremenih kupaca, posebice poslovnim osobama, inovacije u kiosku su odgovor na nedostatak kompromisa između brzog i kreativnog djelovanja. Naime, bilo da se radi o ukusnim kombinacijama okusa ili stvarnom fizičkom rasporedu prijenosnih prostora za hranu, marke i kuhari pronalaze

¹² Institut za turizam, *Glavni plan i strategija razvoja turizma Republike Hrvatske*, 2010. Dostupno na: www.iztg.hr/hr/institut/strategija-razvoja-turizma-rh, (Pristupljeno: 20. srpnja 2019.)

¹³ Ibid.

¹⁴ Vlado Galičić, *Putevi do zadovoljnoga gosta: priručnik za bolje razumijevanje turizma i ugostiteljstva*, Fakultet za menadžment u turizmu i ugostiteljstvu, Opatija, 2011.

načine za modernizaciju ovog brzog posluživanja.¹⁵

Novi pothvati u marketingu također imaju koristi od hrane koja se naručuje i isporučuje na kioscima. Prvenstveno neobičan izgled objekata privlači prolaznike koji su prisiljeni ili koji žele konzumirati hranu i piće iz kioska. Primjer inovacije u kiosku je Samba Swirl maloprodajna lokacija Camdena koja se može pohvaliti futurističkim interijerom s LED rasvjetom raspoloženja. Trgovina u Velikoj Britaniji Froyo konzultirala se s brendom rasvjete InStyle LED za njihov najnoviji projekt dizajna trgovine koji sadrži senzoričke zaslone različitih nijansi. Led svjetlo je spojeno s linearnim pločicama na podu i stropu, te je obrubljeno osvijetljenim detaljima rešetke.¹⁶ Ostatak unutrašnjosti kioska sastoji se od industrijskog namještaja i linearnih zidnih pregrada koji izgledaju slojevito i geometrijski u cjelokupnom izgledu. Ovaj suvremeni maloprodajni prostor odbacuje tradiciju i umjesto toga stvara impresivno iskustvo za svoje posjetitelje. Navedeni kiosk nudi voćne jogurte, te druge prerađevine od voća i mlijeka. Navedeni primjer se može pohvaliti estetikom futurističkog dizajna. Nastavno, ističe se primjer Farmers Fridge, koji nudi prirodnu zdravu hranu. Kiosk je specijaliziran za pravljenje i prodaju salata. Inovacija se ne krije samo u enterijeru i eksterijeru ovog kioska je u tome da se salata pakira u zapečaćene spremnike koji se mogu reciklirati i na taj način se unaprjeđuje savjest na različitim povezanim razinama.

- *Inovacije u nepokretnim vozilima* – Suvremeno vozilo koje nudi ponudu brze hrane nije obično vozilo koji se može sresti na ulicama već predstavlja sredstvo razvoja jednostavnih kulinarskih izričaja. Ponuda je često ograničena, ali i fokusirana na kreativna jela po prihvatljivim cijenama te nudi kupcima priliku da isprobaju hranu koja nije u uobičajenoj ponudi. Pronalazak tržišne niše predstavlja put do uspjeha za većinu vozila. Dok se jedno vozilo može specijalizirati za hamburgere, drugi može poslužiti samo ribu.¹⁷ Praćenje vozila hrane olakšano je društvenim mrežama poput Facebooka i Twittera, gdje

¹⁵ Svetlana Rodgers, „Innovation in Food Service Technology and its Strategic Role,“ *International Journal of Hospitality Management*, Vol. XXVI, No. 4, 2007, str. 899-912.

¹⁶ Meghan Young, „The Farmers Fridge Provides Healthy, Eco-Friendly Food On-The-Go“, 2014.

<https://www.trendhunter.com/trends/farmers-fridg>, (Pristupljeno: 20. srpnja 2019.)

¹⁷ Tim Grey, „Meals on wheels: Australia’s best food trucks,“ *The New Daily*, 2014.

Dostupno na: <https://thenewdaily.com.au/life/eat-drink/2014/01/21/meals-wheels-australias-best-food-trucks/> (Pristupljeno: 20. srpnja 2019.)

se u svakom trenutku može locirati parkirano omiljeno gurmansko vozilo, uz ažuriranja ponuda, novih stavki izbornika i promjena lokacije. Grey¹⁸ tvrdi kako su društveni mediji najveći faktor koji je doprinio probojnom uspjehu gurmanskog vozila za hranu.

Tržište SAD-a ključno je za porast popularnosti vozila za prehranu. Tako se na različitim skupovima često zvanima *food truck* festivalima, mogu pronaći vozila koja na jednom mjestu nude različita jela, različitih kultura. Tako je u kolovozu 2013. godine Tampa bila domaćin najvećeg svjetskog mitinga vozila za hranu na kojem je sudjelovalo 99 vozila. Rally Tampa oborila je vlastiti rekord okupljajući 121 kamion s hranom u 2014. godini. U Chicagu se svake godine ugosti preko 40 kamiona sa 60.000 gostiju koji sudjeluju u dva dana, a parkovi kamiona s hranom koji nude stalne lokacije nalaze se u urbanim i prigradskim područjima širom svijeta. Popularnost vozila s hranom dovodi do stvaranja udruga koje štite i podržavaju njihova poslovna prava, poput Philadelphia Mobile Food Association.¹⁹ Inovacija u vozilima se prvenstveno odnosi na njihov izgled, koji sve više privlači zainteresirane da probaju hranu, inovacija je i u njihovoj ponudi, spoju različitih kultura kroz ponudu jela.

- *Inovacije u šatorima* – Šator kao ugostiteljski objekt je dugo godina aktualan, a u posljednje vrijeme sve više s obzirom da su upravo šatori najčešće *beach* barovi na plaži. *Beach* barovi imaju otvorenu jednu ili dvije strane šatora, te tako nude poglede i jedinstven ambijent, posebice na lokacijama uz more, na plažama. Inovacije se odnose na to što su prvo šatori postali *beach* barovi, a drugo što su specifičnog izgleda, odnosno atraktivni su i privlače velik broj posjetitelja. Inovacije u šatorima se odnose ponajviše na vizualni izgled s naglaskom uklapanja u okoliš u kojem se smješta šator.
- *Inovacije u jednostavnim uslugama na klupi* – Posluživanje hrane u jednostavnim uslugama na klupi je atraktivno s obzirom da se hrana priprema pred očima kupca/posjetitelja.

Kada je riječ o inovacijama ponude u objektima jednostavnih usluga naglasak je na ponudi hrane, odnosno posvećenosti pružanju uravnoteženih obroka puno radno vrijeme, te dijetetičara koji zajedno rade na stvaranju ino-

¹⁸ Ibid.

¹⁹ Francis Hundley, „Food truck park opening in Plano as suburbs get rolling to catch up with trend,“ *Dallas Morning News*, 2015. Dostupno na: <https://www.dallasnews.com/news/plano/2015/03/24/food-truck-park-opening-in-plano-as-suburbs-get-rolling-to-catch-up-with-trend> (Pristupljeno: 20. srpnja 2019.)

vativnih, ukusnih i hranjivih obroka. Nadalje, hrana je, kada je riječ o organiziranim dostavama, samo telefonskim pozivom udaljena od korisnika te predstavljena putem ICT tehnologija, mobilnih aplikacija, društvenih mreža i web stranica. Na stranicama objekata se prikazuje pregledni izbornik s ponudom, odnosno jelima koja se brzo pripremaju i poslužuju, cijenama, kalorijskim vrijednostima, podacima o porijeklu i slično.

4. ISTRAŽIVANJE O INOVACIJAMA U OBJEKTIMA JEDNOSTAVNIH USLUGA

Za potrebe predavljanja teoretske platforme rada podatci su se prikupljali iz sekundarnih izvora, internetskih baza podataka te knjižničnih centara.

4.1. Metodologija istraživanja

U postupku pisanja ovog rada koriste se općeprihvaćene metode i tehnike znanstvenog istraživanja za prikupljanje, pripremu i obradu podataka koje će biti input istraživačkom procesu, te stručna i znanstvena literatura i časopisi. Metodologija, uz provedeno istraživanje literature znanstvenim metodama analize, sinteze, deskripcije, dedukcije, generalizacije i sistematizacije uključuje primarno, originalno istraživanje anketom, odnosno osobnim ispitivanjem. Naime, istraživanje se temeljilo na osobnom kontaktu s ispitanicima, koje se odvijalo u dvije faze, ispunjavanje upitnika te osobni intervju kao podrška evaluaciji fotografija i provedbi Likert istraživanja. Istraživanje je provedeno u Istri, u rujnu 2019. godine a stopa odgovora je visoka 98% i uzorak je validan. Anketni list je sadržavao je devet pitanja s ponuđenim odgovorima, tri otvorena pitanja, četiri fotografije indikativne za evaluaciju inovacija te Likert istraživanje za devet tvrdnji na koje ispitanici iskazuju razinu slaganja od 1 do 5 gdje je: 1 – uopće se ne slažem, 2 – slažem se, 3 – niti se slažem niti se ne slažem, 4 – slažem se, 5 – u potpunosti se slažem. Obrada podataka se odnosi na integraciju i evaluaciju podataka iz provedenog istraživanja na uzorku od 50 ispitanika. Prikupljeni podatci se transformiraju u statističke rezultate koji se prikazuju tablično i grafički. Također, bilježe se i kvalitativna i kvantitativna obilježja, te se interpretiraju nastavnu u radu.

4.2. Rezultati istraživanja

U anketi je sudjelovalo 50 ispitanika od kojih je 40% (N=20) muškog spola i 60% (N=30) ženskog spola. Najveći broj ispitanika, 22% (N=11) je između 36 i 45 godina, potom isto brojno, deset osoba, (20,5%) između 46 i 55 godina kao i 18-25 godina. Slijedi 16% ispitanika od 26-35 godina (N=8), a najmanji broj sudionika, 3% (N=2) spada u dobnu skupinu više od 65 godina. Istražena je i stručna sprema ispitanika koja korelira s razinom prihoda i budžetom za potrošnju gdje se evidentira 40% (N=20) ispitanika sa srednjom stručnom spremom SSS, slijedi Visoka stručna sprema VSS, 30% (N=15), te viša stručna sprema VŠS, 22% (N=11).

Istraživanje dalje propituje potrošačke navike razmatrane s aspekta učestalosti i motivacije posjećivanja jednostavnih ugostiteljskih objekata. Rezultati ukazuju kako 48% (N=24) ispitanika svakodnevno posjećuje objekte jednostavnih usluga, njih 40% (N=20) ih posjećuje često (tjedno i više puta), 10% (N=5) ih posjećuje rijetko (jednom mjesečno), a 2% (N=1) ih ne posjećuje nikada. Nastavno razmatra se motivacija posjeta. Obzirom na mogućnost višestrukog odgovora, rangira se motivacija kako slijedi: 1) brza usluga (62%), 2) kvalitetna usluga (48%), 3) blizina stana/kuće/posla (30%), ugodan interijer i eksterijer (30%), 4) zdrava hrana i piće (16%). Na pitanje o ulozi cijene prilikom konzumiranja usluga jednostavnih ugostiteljskih usluga, 38 ispitanika obraća pažnju na cijenu (76%), dok njih pet ne obraća pažnju na cijenu (10%). Razmatrajući financijska sredstva koja se troše po osobi prilikom posjeta, ističe se predominantan podatak gdje 40% (N=20) ispitanika troši od 10-20 kn, njih 18% troši od 20-50 kn, a 22% više od 50 kn. Nakon pitanja o posjećivanju jednostavnih objekata ispitanicima su predstavljene slike jednostavnih ugostiteljskih objekata koji tipičnih za pojedinu skupinu: 1) paviljonski kiosk, 2) *food truck* – mobilna prikolica kamion sa hranom, 3) *pop-up* štand 4) kreativan, tematiziran štand sa ponudom hrane. Istražene su asocijacije putem otvorenog upitnika te su bilježeni odgovori: „prehrana u hodu“, *fast finger food*, brza hrana, nezdrava hrana, upitnost higijene.

Navedeni odgovori sugeriraju na uvođenje promjena. Prvo interijer i eksterijer nisu zadovoljili kriterije ispitanika, što znači da je i na tom području potrebno provesti određene inovacije, po uzoru na primjere dobre prakse, gdje su ovakvi objekti atraktivni upravo zbog svog interijera i(li) eksterijera. Također, ispitanici su naveli asocijaciju nezdrave hrane, ulične hrane. Analizom primjera dobre prakse uočeno je kako se u ovim objektima sve više i češće nudi zdrava hrana, kao i hrana za određene skupine koji jedu samo određene namirnice.

Nakon slika ispod kojih su se navodile asocijacije, ispitanici su pred sobom imali sedam tvrdnji s kojima su oni iznijeli svoje (ne)slaganje, prema Likertovoj skali. Na koncu je pred ispitanike stavljeno nekoliko tvrdnji o čijem utjecaju na kupnju su iznijeli svoje mišljenje i stavove. Rezultati se donose u sljedećoj tablici i sljedećem grafu.

Tablica 1. Stavovi ispitanika o ponuđenim tvrdnjama

	1	2	3	4	5	N - Σ	Avr.	STDEV
Objekti jednostavnih usluga imaju kvalitetan marketing.	44%	16%	28%	6%	6%			
N	22	8	14	3	3	107	2,14	8,093
U jednostavnim ugostiteljskim objektima su u ponudi namirnice različitih kultura.	22%	18%	20%	20%	20%			
N	11	9	10	10	10	149	2,98	0,707
Jednostavni ugostiteljski objekti se prilagođavaju trendovima na tržištu.	4%	6%	4%	6%	80%			
N	2	3	2	3	40	226	4,52	16,777
Jednostavni ugostiteljski objekti su fleksibilni prema zahtjevima gostiju.	10%	10%	20%	12%	48%			
N	5	5	10	6	24	189	3,78	8,093
Cijene usluga u objektima jednostavnih usluga su u skladu s ponudom.	4%	12%	8%	8%	76%			
N	2	6	4	4	34	212	4,24	13,490
Inovativna ponuda bi me privukla da češće posjećujem objekte jednostavnih usluga.	0%	0%	0%	90%	10%			
N	0	0	0	45	5	205	4,1	19,685
Kvaliteta pružene usluge ima velik utjecaj na odluku o ponovnom posjetu.	0%	0%	10%	80%	10%			
N	0	0	5	40	5	200	4	16,955
Interijer i eksterijer objekata jednostavnih usluga utječe na odluku o posjetu.	0%	0%	0%	90%	10%			
N	0	0	0	45	5	205	4,1	19,685

Izvor: Izrada autora.

Rezultati ukazuju kako objekti ne provode u cijelosti kvalitetan marketing i promotivne aktivnosti (60%), pa potrošači nisu dovoljno upoznati s

ponudom istih. Također, problem je i što u objektima nisu zastupljene namirnice različitih kultura (40%), iako se prema najvećem broju ispitanika jednostavni ugostiteljski objekti prilagođavaju trendovima na tržištu (86%) te su fleksibilni prema zahtjevima gostiju (60%). Najveći broj ispitanika se slaže s tvrdnjom da su cijene u skladu s ponudom (84%), no da bi inovativna ponuda privukla ispitanike na češće posjete i konzumaciju u objektima s jednostavnim uslugama. Također, prema ispitanicima interijer i eksterijer imaju ključnu uslugu za odluku o posjetu (100%), što je i potvrdilo asocijacije, odnosno odgovore na prethodno pitanje.

Finalno, razmatranjem odgovora ispitanika, se može reći kako ispitanici nisu upoznati s mogućnostima ponude i izgleda objekata jednostavnih usluga, jer nedovoljnim ulaganjem u marketing ovi objekti ostaju daleko od očiju javnosti. Inovacija se treba primijeniti u ponudi te izgledu objekata no ponajviše u korištenju smart tehnologija u vidu afirmacije ograničenih budžeta za kvalitetnu i učinkovitu online promociju.

5. ZAKLJUČAK

U suvremenom smart okruženju najveći naglasak se stavlja na inovativnost kroz povezivanje industrija, povezivanje različitih mjesta svijeta i povezivanje tehnologije. Prilike u današnjem gospodarstvu su bez presedana, ali uz mnoštvo prilika dolazi i mnoštvo izazova, poput primjerice aktualne COVID pandemije koja ugrožava konkurentnosti i predstavlja pred ponuđače ugostiteljskih usluga nove izazove za postizanje konkurentnosti. Mala i srednja poduzeća u ugostiteljstvu i mikro poduzetništvo reagibilna su na promjene u okruženju i volatilnosti potražnje. Isto utječe na promišljanja o novim proizvodima, kreativnijim načinima obavljanja različitih djelatnosti, te novim, najčešće bržim i jednostavnim stvaranjem profita. Inovativnost koja se provodi na mikro razini u samim poduzećima usmjerena je na inovativni marketing, koji u središte konkurentnosti stavlja potrošača i njegov doživljaj i percepciju kvalitete usluge. Važnost inovativnosti je u stvaranju vrijednosti. Financijska sredstva su ključno pitanje provedbe inovacija i stvaranja nove kvalitete u ugostiteljstvu, stoga je potrebno pametno pristupu izboru onog u što vrijedi uložiti, te biti otvoren na suradnju u području u kojem je željeni inovativni proizvod.

Inovacije u tehnologiji prehrambenih usluga nude diferencijaciju i troškovno vodstvo u strateškom smislu. Većina poduzeća koja posluju s hranom nemaju laboratorije za istraživanje i razvoj. Trenutno su inovacije u dizajnu

i rasporedu opreme, tehnici pakiranja i usluge obrambenog ili reaktivnog karaktera. Primjeri obrambenih inovacija uključuju brže i bolje metode pripreme, poboljšanu kontrolu temperature, čak i grijanje, uštedu energije i rada, manje otpada, bolju sanitarnu zaštitu, bržu uslugu i fleksibilnost. Suprotno tome, događaji uvredljivih ili proaktivnih inovacija, koji mogu radikalno promijeniti trenutnu praksu, su rijetki. Novi postupci prehrambene usluge mogu se razviti uslijed usvajanja tehnoloških probojnosti u „visokotehnoškim“ poljima ekonomije. To opravdava ulaganje u uvredljiva istraživanja i naglašava važnost tehničkih kompetencija za stručnjaka koji se bavi uslugama prehrane. Prema prikazanim inovacijama u objektima jednostavnih usluga može se zaključiti kako se inovacije javljaju na području izgleda, odnosno interijera i eksterijera, koji objekte izdvaja od konkurenata i koji postaju „*must see*“. Za vizualni izgled inovacije se javljaju i na području ponude.

Sve više su u ponudi zdrava jela različitih kultura, ambalaža u kojoj se poslužuje hrana i piće su od materijala koji se mogu reciklirati. Bitno je naglasiti i veliku ulogu marketinga u radu objekata jednostavnih usluga, čije internet stranice, prisustvo na društvenim mrežama te kreativne i informativne objave također predstavljaju jedan oblik inovacije u promocijskom spletu. Razmatrajući tematiku i istraživanje, ističe se i ograničavajući čimbenik koji je utjecao na mogućnost istraživanja same digitalne promocije pružatelja jednostavnih ugostiteljskih usluga. Naime, obzirom da je riječ o firmama iz domene mikro poduzetništva, autori su naišli na nemogućnost cjelovite identifikacije svih pružatelje usluga u jednoj destinaciji, a analitika nepotpunog uzorka nije validna.

Prema provedenom istraživanju na uzorku od 50 ispitanika može se zaključiti kako ispitanici često posjećuju objekte te njih 68% troši po osobi do 50 kuna. Spremni su na veću potrošnju i česti posjet kad bi ponuda bila bolja, odnosno kad bi možda čuli i saznali za neki objekt koji privlači svojim interijerom i eksterijerom. Ističe se važnost korespondentnosti omjera kvalitete ponude hrane i afirmaciji vrijednosti za novac. Ono što se može izdvojiti i što ukazuje na potrebu uvođenja inovacija u objektima jednostavnih usluga je što na ponuđene slike objekata dosta ispitanika je izrazilo svoj stav o upitnosti kvalitete i higijene što predstavlja platformu za nova istraživanja. Istraživanje dokazuje da interijer i eksterijer jednako privlače goste te isto otvara mogućnosti brojnim tematskim i gastronomskim tematizacijama. Isto se, u postojećim uvjetima ubrzane prolaznosti i težnjama za novim doživljajima ističe kao ključna konkurentna prednost koja može doprinijeti kvaliteti poslovanja i inovativnom tržišnom pozicioniranju.

Priznanje:

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Abstract:

IMPORTANCE OF INNOVATION FOR QUALITY AFFIRMATION IN HOSPITALITY INDUSTRY – SIMPLE SERVICE CATERING FACILITIES

This paper research innovation in simple services catering facilities related on achievement of new quality and competitiveness. The paper conceptually defines and presents the characteristics of simple service catering facilities as well as the importance of innovations and focuses on innovations in simple service facilities. The aim and purpose of this paper is to investigate the perception of consumers about the importance of the quality improvement of the simple food service catering facilities and contribute to the improvement of the offer. The conducted research uses qualitative and quantitative methodology to address consumer attitudes and presents guidelines for the competitiveness of simple service catering facilities. The paper contributes to the perception of the importance of the quality of specific catering facilities in the global momentum of development.

Key words: hospitality industry, simple service catering facilities, quality, innovation, competitiveness.

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KOMPARATIVNA ANALIZA ZADOVOLJSTVA STUDENATA ONLINE I KONTAKTNOM NASTAVOM

COMPARATIVE ANALYSIS OF STUDENTS' SATISFACTION
WITH ONLINE AND FACE-TO-FACE TEACHING

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SAŽETAK

Zbog pandemije uzrokovane virusom SARS CoV-2 kontaktna nastava hitno je morala prijeći na online oblik prilikom čega je naišla na brojne izazove. Kako bi se osigurala potrebna kvaliteta online nastave važno je dobiti povratne informacije studenata o online nastavnom procesu. Svrha ovog rada je usporediti zadovoljstvo studenata online i kontaktnom nastavom te odrediti najvažnije faktore koji utječu na zadovoljstvo. Istraživanje se provodilo putem online ankete distribuirane studentima na društvenim mrežama. Pokazalo se da su studenti zadovoljniji kontaktnom nastavom i ne žele da se online nastavni proces nastavi nakon pandemije. Studenti tvrde da je kontaktna nastava kvalitetnija u odnosu na online nastavu.

Ključne riječi: online nastava, kontaktna nastava, kvaliteta u obrazovanju, akreditacija.

1. UVOD

Virus SARS CoV-2 pojavio se u Kini u provinciji Wuhan nakon čega se počeo ubrzano širiti te je poprimio razmjere pandemije. Virus se primarno širi u kontaktu s inficiranom osobom putem kapljica iz usta i nosa koje nastaju prilikom govora, kašljanja i kihanja i koje izravno padaju na sluznicu nosa, usta ili očiju druge osobe.¹ Svaka zemlja unutar sebe definira Nacionalni stožer civilne zaštite koji donosi mjere za zaštitu građana. Jedna od tih mjera za zaštitu građana od virusa SARS CoV-2 je uvođenje karantene. Karantena je protuepidemijska mjera koja se provodi na određeno vrijeme i u određenom mjestu, u ovom slučaju na ljudima. Svrha karantene je izolirati i ograničiti kretanje ljudi.² Prva karantena u Hrvatskoj za vrijeme pandemije virusa SARS CoV-2 počela je u ožujku 2020. godine. Dakle, kako bi se spriječilo širenje pandemije, Nacionalni stožer je, kao jednu od mjera vezanih uz karantenu, definirao zatvaranje škola i visokoškolskih ustanova što je rezultiralo prilagodbom obrazovnog sustava novonastalim uvjetima. Drugim riječima, obrazovni sustav započeo je s izvođenjem online nastave, odnosno prilagodbom nastavnog procesa novonastalim uvjetima. Nadalje, s početkom izvođenja online nastave, javljaju se brojni izazovi povezani s novom perspektivom online obrazovanja i tehnološkim složenostima navedenog obrazovanja.³ Pandemija je nametnula naglu obrazovnu promjenu na koju se dionici nisu mogli tako brzo prilagoditi. Kad se govori o ocjeni kvalitete nastavnog procesa od strane nastavnog osoblja, postoje suprotni stavovi. Dio nastavnog osoblja podržava online nastavu i govori kako online nastava nudi znatno veću fleksibilnost u odnosu na kontaktnu nastavu, dok protivnici online nastave naglašavaju kako je kontaktna nastava po svojoj prirodi znatno kvalitetnija zbog neposrednog kontakta između nastavnika i studenta.⁴ Koncept online nastave ima svoje prednosti i mane, no činjenica je da je prepoznat i prihvaćen na me-

¹ Ivan Vasilj, Ivona Ljevak, „Epidemiološke karakteristike COVID-a 19,“ *Zdravstveni glasnik*, Vol. 6, No. 1, 2020, str. 9-18.

² Lucija Larma, *Karantena kao mjera prevencije širenja zarazne bolesti COVID-19* (Doctoral dissertation, University of Rijeka. Faculty of Medicine. Department of Environmental Medicine), 2020.

³ Lokanath Mishra, Tushar Gupta, Abha Shree, „Online teaching-learning in higher education during lockdown period of COVID-19 pandemic“, *International Journal of Educational Research Open*, 1, 100012, 2020.

⁴ Tatiana Markova, Irina Glazkova, Elena Zaborova, „Quality issues of online distance learning,“ *Procedia-Social and Behavioral Sciences*, 237, 2017, pp. 685-691.

đunarodnoj i nacionalnoj razini.⁵ No, osim nastavnog osoblja, neophodno je sagledati i zadovoljstvo studenata kvalitetom online nastavnog procesa kako bi se u budućnosti mogle definirati mjere usmjerene prema poboljšanju istog. S obzirom na to, cilj je ovog rada utvrditi zadovoljstvo studenata na teritoriju sjeverozapadne Hrvatske online i kontaktnom nastavom te usporediti njihovo zadovoljstvo. U radu je postavljena hipoteza: Studenti su zadovoljniji kontaktnom nastavom.

2. ZAKONSKI OKVIR ZA UVOĐENJE ONLINE OBRAZOVANJA

Sustav visokog obrazovanja i znanstvena djelatnost regulirani su Zakonom o znanstvenoj djelatnosti i visokom obrazovanju.⁶ Kako bi nastava za vrijeme karantene bila izvediva, otvorena je mogućnost provođenja online nastave. Online nastavu odobrava Nacionalno vijeće za znanost, visoko obrazovanje i tehnološki razvoj. Sva ostala pitanja o provedbi i ocjenjivanju u online nastavi regulira visoko učilište u svom Statutu.⁷ Nacionalno vijeće za znanost, visoko obrazovanje i tehnološki razvoj, između ostalog, uređuje status, djelatnost i ustrojstvo Agencije za znanost i visoko obrazovanje. Agencija je javna ustanova u Republici Hrvatskoj koja se bavi osiguravanjem i unaprjeđivanjem kvalitete u znanosti i visokom obrazovanju.⁸

Jedna od aktivnosti koje Agencija provodi je i postupak inicijalne akreditacije. Drugim riječima, da bi visoko učilište moglo provoditi online nastavu, ono mora dobiti odobrenje, odnosno mora biti akreditirano za provođenje online nastave. Dakle, sve obrazovne institucije koje nemaju dopusnicu za izvođenje online nastave ne smiju u potpunosti prijeći na izvođenje online nastave budući da za to nisu dobile dopuštenje. Kad se govori o pojmovnom određenju online nastave, odnosno online studiranja „Online studij oblik je studija osmišljen tako da se djelomično ili u potpunosti izvodi online, a akademski naziv koji se stječe njegovim završetkom ravnopravan je akademskom nazivu koji se stječe završetkom klasičnog studija. Ishodi učenja online

⁵ Alen Host, Jelena Jardas Antičić, Lara Jelenc, Helga Pavlić Skender, Željko Rački, Danijela Sokolić, *Uvođenje novih tehnologija u nastavni proces: kako uvesti online studijske programe u nastavni kurikulum u visokom obrazovanju*. Sveučilište u Rijeci, Ekonomski fakultet, 2018.

⁶ Zakon o znanstvenoj djelatnosti i visokom obrazovanju, (NN 123/03, 198/03, 105/04, 174/04, 02/07, 46/07, 45/09, 63/11, 94/13, 139/13, 101/14, 60/15).

⁷ Alen Host, Jelena Jardas Antičić, Lara Jelenc, Helga Pavlić Skender, Željko Rački, Danijela Sokolić, *Uvođenje novih tehnologija u nastavni proces: kako uvesti online studijske programe u nastavni kurikulum u visokom obrazovanju*. Sveučilište u Rijeci, Ekonomski fakultet, 2018.

⁸ Ibid.

studija ne smiju se razlikovati od onih stečenih na programu koji se izvodi na klasičan način.⁹ Klasičan način izvođenja studija odvija se kontaktno. Studenti i profesori razmjenjuju znanje neposredno u fizičkoj predavaonici koja je opremljena posebnom opremom kako bi se ta razmjena lakše i djelotvornije odvijala.

No, potrebno je naglasiti kako postoji stanovita razlika između studija koji je u potpunosti prilagođen izvođenju online i dopusnice za izvođenje takvog studija i online nastave koja se izvodi zbog trenutne situacije u nekom sustavu bez da je institucija koja izvodi ovakav oblik nastave akreditirana za isto. Drugim riječima, u slučaju odluke nacionalnog tijela, visokoškolske ustanove mogu započeti s izvođenjem online nastave i u tom slučaju se govori o hitnoj online nastavi. Hitna online nastava klasični je studijski program prenesen u online okruženje zbog izvanrednih okolnosti koje onemogućavaju kontaktno izvođenje.¹⁰

2.1. Opće smjernice za osiguranje kvalitete online nastave

Europska udruga za osiguravanje kvalitete u visokom obrazovanju (ENQA) izdala je Opće smjernice za osiguravanje kvalitete online nastave. Prema tim bi smjernicama visoka učilišta koja provode online nastavu trebala prilagoditi svoje unutarnje sustave osiguranja kvalitete kako bi se zajamčila kvaliteta procesa učenja. Drugim riječima, online nastavni proces mora biti identičan nastavnom procesu koji se izvodi kontaktnim putem. Studenti koji participiraju u online nastavnom procesu moraju imati iste kompetencije kao i studenti koji participiraju u kontaktnoj nastavi.

2.1.1. Unutarnje osiguravanje kvalitete

Kad se govori o sustavu upravljanja kvalitetom u visokoškolskim ustanovama, isti je definiran kroz smjernice koje definira nacionalno tijelo, odnosno tijelo zaduženo za visoko obrazovanje. U kontekstu Republike Hrvatske, a s obzirom da je Republika Hrvatska članica Europske Unije, za sve visokoškolske ustanove obvezujuća je primjena Europskih standarda i smjernica u nastavnom procesu (ESG). ESG definira niz zahtjeva koje postavlja na nastavni proces, a jedan od njih je i uspostava unutarnjeg osiguranja kvalitete. Drugim riječima, visoka učilišta moraju imati politiku osiguranja kvalitete. Politika mora biti javno dostupna te mora činiti dio strateškog upravljanja

⁹ <https://www.azvo.hr> (31.03.2021.)

¹⁰ Ibid.

učilišta, a u njega je uključeno i online učenje. Unutarnji dionici obavezni su razvijati i provoditi navedenu politiku putem odgovarajućih procesa, a pritom moraju uključivati i vanjske dionike.¹¹ Dakle, sva visoka učilišta bez obzira provode li online nastavu ili kontaktnu nastavu moraju uspostaviti ovakav sustav u kojem će osigurati kvalitetu nastavnog procesa, a što se postiže mjerenjem trenutnih performansi istog i definiranjem poboljšanja.

Nadalje, učilište je obvezano osigurati da se programi izvode tako da potiču studente na preuzimanje aktivne uloge u procesu učenja te da se vrednuju na temelju ishoda učenja. Tehnička infrastruktura mora biti usklađena s nastavnim metodologijom i online metodama provjere znanja. Studenti moraju biti informirani o svim zahtjevima po pitanju tehničke opreme, digitalnih vještina i online učenja.¹² Drugim riječima, visoko učilište mora osigurati svu tehničku infrastrukturu potrebnu za provođenje nastave što otvara pitanje osiguranja računala i drugih komponenti koje su potrebne za provođenje online nastave.

Isto tako, jedan od zahtjeva koji se postavlja na sustav osiguranja kvalitete vezan je i uz analizu zadovoljstva studenata nastavnim procesom, odnosno vrednovanje rada nastavnika i suradnika koji su uključeni u nastavni proces. Kad se govori o evaluaciji i analizi zadovoljstva online nastavom, visoka učilišta u Republici Hrvatskoj provode interne ankete vezane uz online nastavu u kojima analiziraju mišljenja studenata oko online nastave i njihovog zadovoljstva istom. S druge strane, u nastavnim procesima koji se izvode kontaktno, periodično se kroz ankete provjerava zadovoljstvo studenata nastavnicima, odnosno traži se ocjena kvalitete njihova rada.

2.1.2. Vanjsko osiguravanje kvalitete

Vanjskim osiguravanjem kvalitete utvrđuje se djelotvornost procesa unutarnjeg osiguravanja kvalitete opisanog u prethodnom poglavlju. Ono mora biti definirano i osmišljeno tako da ispunjava postavljene svrhe i ciljeve. Pritom mora uzeti u obzir relevantne propise. U unapređivanje vanjskog osiguranja kvalitete moraju biti uključeni svi dionici.¹³ Procesi vanjskog osiguranja kvalitete trebaju biti pouzdani, korisni, definirani, dosljedno provedeni i objavljeni. Navedeni procesi obuhvaćaju: samovrednovanje, vanjsko vrednovanje, izvješće vanjskog vrednovanja i dosljedno naknadno praćenje. Vanjsko osiguravanje kvalitete provode povjerenstva vanjskih stručnjaka

¹¹ Ibid.

¹² Ibid.

¹³ Ibid.

koja uključuju i studentske predstavnike.¹⁴ Svi konačni ishodi koji proizlaze iz vanjskog osiguravanja kvalitete moraju se temeljiti na definiranim i objavljenim kriterijima koji se dosljedno primjenjuju. Cjelovita izvješća stručnih povjerenstava moraju biti objavljena i jasna. Prigovori i žalbe moraju biti jasno definirani kao dio procesa vanjskog osiguravanja kvalitete, a visoka učilišta o njima moraju biti informirana.¹⁵

2.2. Poboljšanje nastavnog procesa

Evaluacija je sastavni dio svakog procesa pa tako i obrazovnog. Iako postoje razne metode evaluacije obrazovnog procesa, jedna od njih su povratne informacije studenata.

Student je ključan dionik u obrazovnom procesu. Svaka povratna informacija studenta može i treba biti iskorištena. Pozitivne povratne informacije poželjne su jer ukazuju na uspješno funkcioniranje obrazovnog sustava. No, negativne povratne informacije igraju važnu ulogu u poboljšanju kvalitete. One ukazuju na nedostatke obrazovnog procesa. Vodeća tijela obrazovne ustanove trebala bi staviti fokus na te nedostatke i raditi na njihovom sankcioniranju. Na takav se način stvara kvalitetan obrazovni proces. Obrazovni sustav trenutno se nalazi u izazovnoj situaciji uzrokovanoj SARS CoV-2 virusom. Nastava se hitno morala prebaciti s kontaktnog na online oblik. Zbog navedene nagle promjene, poboljšanje kvalitete obrazovnog procesa potrebnije je nego ikada. U provedenoj anketi studenti su evaluirali online nastavu u odnosu na kontaktnu te tako istaknuli glavne mane i prednosti svakog oblika nastave.

3. EMPIRIJSKI DIO

Kao tehnika prikupljanja informacija korištena je anketa provedena putem Google Forms obrasca. Informacije su prikupljane tijekom ožujka 2021. godine. Anketa je distribuirana u studentskim grupama na društvenoj mreži Facebook. Anketa se sastoji od tri odjeljka: 1) odjeljak o općim podacima ispitanika i njihovog studija, 2) odjeljak o online nastavi i 3) odjeljak o kontaktnoj nastavi. U odjeljcima o online i kontaktnoj nastavi korištena je Likertova skala s ponuđena pet stupnja: uopće se ne slažem (1), uglavnom se ne slažem (2), niti se slažem, niti se ne slažem (3), uglavnom se slažem (4) i potpuno

¹⁴ Ibid.

¹⁵ Ibid.

se slažem (5). Veća srednja vrijednost odgovora ukazuje na potvrdu izjave dane u anketi. Prikupljene informacije analizirane su i uspoređene pomoću deskriptivne statistike pomoću MS Excel programa. Za testiranje hipoteze koristio se T-test. Signifikantnost razlike komentirana je na razini vjerojatnosti $p < 0,05$.

3.1. Ispitanici

U istraživanju je sudjelovalo 143 ispitanika s područja Sjeverozapadne Hrvatske. Od ukupnog broja ispitanika 112 (78,90%) ispitanika su pripadnice ženskog spola. Ukupni broj muških ispitanika iznosi 30 (21,10%). S obzirom na vrstu studija, sveučilišni studij pohađa 113 (79,60%) ispitanika, a stručni studij pohađa 29 (20,40%) ispitanika. U Tablici 1 prikazan je broj ispitanika s obzirom na godinu studija koju pohađaju.

Tablica 1. Broj ispitanika s obzirom na godinu studija

Godina studija	Broj ispitanika	Postotni udio
1. godina – preddiplomski studij	24	16,90%
2. godina – preddiplomski studij	35	24,60%
3. godina – preddiplomski studij	40	28,20%
1. godina – diplomski studij	25	17,60%
2. godina – diplomski studij	13	9,20%
3. godina – integrirani studij	1	0,70%
4. godina – integrirani studij	1	0,70%
5. godina – integrirani studij	1	0,70%
6. godina – integrirani studij	2	1,40%

Izvor: Autorica prema anketnim podacima

Prije evaluacije online i kontaktne nastave, ispitanici su u prvom odjeljku trebali navesti način putem kojeg trenutno pohađaju nastavni proces. Mogućnost odgovora na ovo pitanje bila je višestruka. Rezultati toga pitanja prikazani su u Tablici 2.

Tablica 2. Broj ispitanika s obzirom na način izvođenja nastave

Način izvođenja nastave	Broj ispitanika	Postotni udio
Microsoft Zoom	86	22,75%
Merlin	71	18,78%
Google Meet	65	17,20%
E-mail	55	14,55%
Kontaktna nastava	50	13,23%
Microsoft Teams	37	9,79%
Big Blue Button	5	1,32%
Omega	3	0,79%
Discord	2	0,53%
Skype	2	0,53%
Slack	1	0,26%
LMS	1	0,26%

Izvor: Autorica prema podacima iz ankete.

Iz tablice 2. se može zaključiti da se nastavni proces još uvijek većim dijelom odvija online putem i to najviše preko Microsoft Zoom, Merlin i Google Meet online platformi. U drugom i trećem odjeljku navedene su izjave o online (u drugom odjeljku) i kontaktnoj nastavi (u trećem odjeljku). Izjave su vrlo slične u oba odjeljka kako bi se lakše usporedili odgovori ispitanika. Navedene izjave za online nastavu prikazane su u Tablici 3.3, a izjave za kontaktnu nastavu prikazane su u Tablici 3.4.

3.2. Rezultati

U Tablici 3 i Tablici 4 prikazani su rezultati istraživanja. Rezultati istraživanja u vezi online nastave (Tablica 3) pokazuju da profesori uglavnom redovito održavaju online predavanja (prosječna vrijednost 4,674), trude se na njima objasniti materiju (prosječna vrijednost 4,210) i odgovaraju na online upite studenata (prosječna vrijednost 4,196). No, većina studenata ipak ne želi da se online nastava nastavi nakon pandemije. Razlog za to može biti percepcija da online nastava nije dovoljno kvalitetna, odnosno da studente nedovoljno dobro priprema za uspješno polaganje ispita.

Tablica 3. Izjave o online nastavi

Izjave vezane uz online nastavu	
Profesori redovito održavaju online predavanja.	4,674
Profesori se trude objasniti materiju na online nastavi.	4,210
Online predavanja uspješno me pripreme za ispit.	3,210
Online nastava je zahtjevna.	3,609
Nedostaje mi timski rad koji nije moguće postići putem online nastave.	3,326
Smatram da bi se online nastavni proces mogao poboljšati.	3,928
Profesori odgovaraju na moje online upite koje im šaljem vezano uz nastavu.	4,196
Lako učim iz materijala koji se stavljaju na online platforme.	3,507
Lako komuniciram s profesorima i kolegama na online nastavi.	3,471
Online nastava previše me opterećuje.	3,297
Online nastava je kvalitetna.	3,087
Slobodno se izražavam na online nastavi.	3,464
Online nastava trebala bi se nastaviti i nakon pandemije.	2,442

Izvor: Autorica prema podacima iz ankete.

Prema rezultatima u vezi kontaktne nastave (Tablica 4), profesori se također trude objasniti materiju na kontaktnoj nastavi (prosječna vrijednost 4, 587), a percepcija studenata je da nastavnici redovito odgovaraju na upite studenata (prosječna vrijednost 4,487). Nadalje, identificirano je da ispitanici percipiraju kako ih kontaktna predavanja uspješno pripreme za ispit (prosječna vrijednost 4,659) te da lakše komuniciraju s profesorima na nastavi (prosječna vrijednost 4,987).

Tablica 4. Izjave o kontaktnoj nastavi

Izjave vezane uz kontaktnu nastavu	
Profesori redovito održavaju kontaktna predavanja.	3,529
Profesori se trude objasniti materiju na kontaktnoj nastavi.	4,587
Kontaktna predavanja uspješno me pripreme za ispit.	4,659
Kontaktna nastava je zahtjevna.	3,442
Uživam u timskom radu koji mi omogućuje kontaktna nastava.	3,449
Smatram da bi se kontaktni nastavni proces mogao poboljšati.	3,674
Profesori rado odgovaraju na moje upite na kontaktnoj nastavi.	4,478

Lako učim iz materijala koje koristimo na kontaktnoj nastavi.	4,014
Lako komuniciram s profesorima i kolegama na kontaktnoj nastavi.	4,978
Kontaktna nastava previše me opterećuje.	2,710
Kontaktna nastava je kvalitetna.	4,123
Slobodno se izražavam na kontaktnoj nastavi.	3,623

Izvor: Autor prema podacima iz ankete.

Komparacijom dobivenih rezultata, može se identificirati kako ispitanici percipiraju kako ih kontaktna nastava znatno bolje priprema za ispit u odnosu na online nastavu, te kako je zadovoljstvo studenata pojašnjavanjem materije na kontaktnoj nastavi veće (prosječna vrijednost 4,587) u odnosu na online nastavu (prosječna vrijednost 4,210). Isto tako, identificirano je kako ispitanici percipiraju kontaktnu nastavu kao više kvalitetnu (prosječna vrijednost 4,123) u odnosu na online nastavu (prosječna vrijednost 3,08). Međutim, kad se govori o percepciji težine online nastave, odnosno kontaktne nastave, ispitanici percipiraju kako je online nastava gotovo iste težine (prosječna vrijednost 3,442) u odnosu na kontaktnu nastavu (prosječna vrijednost 3,609) što može ukazati kako je kvaliteta online nastave zadržana bez obzira na zahtjevnost izvođenja iste. No, unatoč tome što je kvaliteta online nastavnog procesa održana, ispitanici percipiraju kako je znatno teže učiti iz materijala za online nastavu (prosječna vrijednost 3,501) u odnosu na materijale iz kontaktne nastave (prosječna vrijednost 4,014). Dakle, može se zaključiti kako materijali koji se koriste u online nastavi nisu dovoljno dobro prilagođeni istoj i kako postoji prostor za poboljšanje što ujedno potvrđuju i ispitanici (prosječna vrijednost 3,928). Za testiranje hipoteze koristio se t-test. Signifikantnost razlike komentirana je na razini vjerojatnosti $p < 0,05$. Temeljem toga postavljena hipoteza se prihvaća i može se reći da su studenti zadovoljniji kontaktnom nastavom u odnosu na online.

4. DISKUSIJA

Rezultati su ukazali na to da studenti percipiraju kontaktnu nastavu kvalitetnijom u odnosu na online nastavu te da žele da se nakon pandemije prekine online nastavni proces. Mogući glavni razlog za to je lakša komunikacija studenta s profesorima, odnosno kolegama na kontaktnom predavanju. Nadalje, online nastava kao takva relativno je nova u obrazovnom procesu na

području Republike Hrvatske te može biti zbunjujuća za studente, odnosno od studenata se traži da se prilagode online nastavnom procesu.

Kad se govori o ostalim istraživačima zadovoljstva online nastavom,¹⁶ provedeno je istraživanje u kojem su autori izvršili komparativnu analizu zadovoljstva studenata online nastavom i mješovitom nastavom, stavljajući naglasak na faktore koji utječu na zadovoljstvo i nezadovoljstvo studenata online nastavom općenito. Istraživanje je pokazalo da studenti više vole online nastavu zbog njezine nezahtjevnosti, ali kao glavnu manu naveli su nedostatak interakcije s profesorima i kolegama. Međutim, potrebno je naglasiti kako drugi autori kao što su to Dziuban i Moskal¹⁷ naglašavaju u svojem istraživanju zadovoljstva online nastavom, kako zadovoljstvo studenata istom može biti različito. Glavni razlog za to je različiti dizajn online nastavnog procesa, odnosno različitost pristupa nastavnika online nastavnom procesu. Drugim riječima, studenti različito percipiraju online nastavu zbog činjenice kako različiti nastavnici različito pristupaju pripremi materijala za online nastavu kao i oblikovanju samog online predavanja.

Istraživanje koje provode Chitkushev, Vodenska, Zlatev¹⁸ ukazalo je kako zadovoljstvo studenata online nastavom može biti determinirano predavačem, odnosno nastavnikom. Isto tako, provedeno istraživanje identificiralo je kako različite grupe studenata različito ocjenjuju kvalitetu online nastavnog procesa s obzirom na pristup predavača. Dakle, zadovoljstvo nastavom determinirano je percepcijom nastavnika i pristupom koji nastavnik ima u nastavi. Tu je potrebno napomenuti kako pristup nastavnika online nastavnom procesu može biti determiniran njegovim obrazovanjem, odnosno kompetentnosti za održavanje online nastave. Za poboljšanje vještina nastavnika u održavanju online nastave potrebno je osigurati institucionalne kapacitete koji će omogućiti školovanje i dodatnu edukaciju vezanu uz pedagoški pristup prema studentima.

Nadalje, jedan od temeljnih nedostataka online nastave je nemogućnost održavanja socijalnog kontakta s drugim studentima u grupi što može rezultirati otuđivanjem, odnosno dodatnim distanciranjem. U istraživanju koje

¹⁶ Michele T. Cole, Daniel J. Shelley, Louis B. Swartz, „Online instruction, e-learning, and student satisfaction: A three year study,“ *The International Review of Research in Open and Distributed Learning*, Vol. 15, No. 6, 2014.

¹⁷ Charles Dziuban, Patsy Moskal, Jessica Thompson, Laauren Kramer, Genevieve DeCantis, Andrea Hermsdorfer, „Student Satisfaction with Online Learning: Is It a Psychological Contract?“ *Online Learning*, Vol. 19, No. 2, p.n. 2, 2015.

¹⁸ Lubomir T. Chitkushev, Irena Vodenska, Tanya Zlateva, „Digital learning impact factors: Student satisfaction and performance in online courses,“ *International Journal of Information and Education Technology*, Vol. 4, No. 4, p. 356, 2014.

su proveli Gruber i ostali¹⁹ identificirano je kako je upravo socijalni kontakt među studentima jedan od važnijih faktora koji može utjecati na zadovoljstvo studenata nastavom. S druge strane, isto istraživanje je ukazalo kako jedan od elemenata nezadovoljstva studenata mogu biti infrastrukturni kapaciteti učilišta. Infrastrukturni kapaciteti učilišta kod izvođenja online nastave kao takvi nisu potrebni budući da se nastava odvija online bez izravne prisutnosti studenata u dvoranama ali je potrebno naglasiti kako unatoč tome treba osigurati svu suprastrukturu koju će nastavnici koristiti u izvođenju nastave.

Istraživanje provedeno u ovom radu također ukazuje na utjecaj interakcije, odnosno socijalnog kontakta na zadovoljstvo studenata. Isto tako, potrebno je naglasiti kako ispitanici smatraju da je kontaktna nastava kvalitetnija u odnosu na online nastavu što se može protumačiti sagledavajući institucionalne kapacitete koji su potrebni za osiguranje normalnog nastavnog procesa. Drugim riječima, nedostatak institucionalnih kapaciteta tj. podrške u suprastrukturi potrebnoj za održavanje online nastave može umanjiti kvalitetu online nastavnog procesa, a jedan od mogućih razloga za to je korištenje više različitih platformi za izvođenje nastave bez definiranja jedne zajedničke platforme od strane nadležnog ministarstva.

Nadalje, u istraživanju je identificirano kako ispitanici smatraju da ih kontaktna nastava znatno bolje priprema za ispit u odnosu na online nastavu. Priprema za ispit od posebne je važnosti zbog činjenice kako se kroz provjeru znanja kroz pismeni ili usmeni ispit provjeravaju ishodi učenja definirani nastavnim planom i programom, odnosno provjerava se je li student zadovoljio ishode učenja. Nadalje, provjeravanje ishoda učenja, odnosno njegovo zadovoljenje može biti znatno kompleksnije online u odnosu na kontaktnu nastavu, a posebice ako se radi o ishodima učenja koji zahtijevaju praktičnu primjenu znanja stečenih na nastavi.

5. ZAKLJUČAK

Virus SARS CoV-2 uzrokovao je globalnu pandemiju i pojavu karantene. Zbog toga su obrazovne ustanove primorane prijeći s kontaktne na online nastavu. Proces prijelaza i prilagodbe pun je izazova za sve dionike obrazovnog sustava. Kako bi se proces mogao poboljšati, važno je uzeti u obzir povratne informacije studenata. Osiguranje kvalitete nastavnog procesa važ-

¹⁹ Thorsten Gruber, Stefan Fuß, Roediger Voss, Michaela Gläser-Zikuda, „Examining student satisfaction with higher education services: Using a new measurement tool,“ *International Journal of Public Sector Management*, 2010.

na je stavka za akreditaciju sveučilišta. Online nastavni proces trebao bi biti jednako kvalitetan kao i kontakti. Vrednovanje nastavnog procesa od strane studenata pridonosi poboljšanju kvalitete tog nastavnog procesa. Istraživanje je pokazalo da su studenti značajno zadovoljniji kontaktnom nastavom. Kontaktna nastava bolje ih priprema za ispite. Iako se profesori na online nastavi trude prenijeti materiju kao i na kontaktnoj nastavi, studenti smatraju da je kontaktna nastava kvalitetnija. Razlog za to može biti percepcije studenata da mogu lakše i jednostavnije komunicirati s profesorom, odnosno kako ih kontaktna nastava znatno bolje priprema za polaganje ispita u odnosu na online nastavu.

Ograničenje ovog istraživanja odnosi se na područje provođenja istraživanja budući da je istraživanje fokusirano isključivo na područje sjeverozapadne Hrvatske. S obzirom na to, budućim istraživačima ovog područja preporučuje se provesti slično istraživanje na razini Republike Hrvatske. Praktična primjena rezultata ovog istraživanja odnosi se na mogućnost definiranja područja poboljšanja online nastavnog procesa kako bi on bio što kvalitetniji, odnosno kako bi se osiguralo da kompetencije studenata koji pohađaju online nastavni proces budu iste kompetencijama studenata koji pohađaju isključivo kontaktni nastavni proces.

Abstract:

COMPARATIVE ANALYSIS OF STUDENTS SATISFACTION
WITH ONLINE AND FACE-TO-FACE TEACHING

Due to the pandemic caused by the SARS CoV-2 virus, face-to-face teaching had to urgently switch to the online form, during which it encountered numerous challenges. In order to ensure the required quality of online teaching, it is important to get student feedback on the online teaching process. The purpose of this paper is to compare student satisfaction with online and face-to-face teaching and to determine the most important factors that affect satisfaction. The research was conducted through an online survey distributed to students on social media. It turned out that students are more satisfied with face-to-face teaching and that they do not want the online teaching process to continue after the pandemic. Students claim that face-to-face teaching is of better quality compared to online teaching.

Key words: online teaching, face-to-face teaching, quality in education, accreditation

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Zaključci 23. međunarodnog simpozija o kvaliteti održanog u Poreču, Hrvatska, 16.-18.3.2022. godine

23. međunarodni simpozij o kvaliteti u organizaciji Hrvatskog društva menadžera kvalitete (HDMK) održan je u tradicionalnom terminu (oko prvog dana proljeća) od 16. do 18.3.2022. godine, u Poreču, u hotelu Diamant. Zbog epidemiološke situacije simpozij je održan na tzv. hibridni način tako da je u Poreču, u hotelu, fizički sudjelovalo oko 45 sudionika, a isto toliko online, koji su se uključili u rad simpozija s četiri kontinenta. Suorganizatori simpozija bili su: 1) MSEECQI – Middle and South East European Countries Quality Initiative; 2) Herzen State Pedagogical University, Faculty of Management, St. Petersburg, Rusija; 3) Department of Production Engineering and Safety, Faculty of Management Czestochowa, University of Technology, Czestochowa, Poljska; 4) Sveučilište Sjever, Varaždin – Koprivnica, Hrvatska; 5) University of Žilina, Žilina, Slovačka i 6) Sveučilište Jurja Dobrile u Puli, Pula, Hrvatska.

Simpozij je održan pod radnim nazivom;
„KVALITETA – JUČER, DANAS, SUTRA“

Pokrovitelji simpozija bili su: MSEECQI – Middle and South East European Countries Quality Initiative (Inicijativa za kvalitetu zemalja srednje i jugoistočne Europe), Ministarstvo gospodarstva i održivog razvoja, Hrvatska gospodarska komora, Hrvatska akreditacijska agencija, Državni zavod za mjeriteljstvo, Hrvatski poslovni savjet za održivi razvoj, Sveučilište u Zagrebu, Sveučilište Jurja Dobrile u Puli, Ekonomski fakultet u Zagrebu (Poslijediplomski specijalistički studij Upravljanje kvalitetom), Zaklada Hrvatske nagrade za kvalitetu. Medijski pokrovitelji bili su: Poslovni savjetnik, Suvremena.hr, Kvalitet & izvrsnost, Beograd; Portal Kvalitet, Beograd; PoslovniFM, znanstveni časopis Production Engineering Archives, Poljska. Donatori i sponzori bili su: Sveučilište Sjever Varaždin – Koprivnica, Zračna luka Zagreb d.o.o., Gradska plinara Zagreb d.o.o., Zagreb; BDO Savjetovanje d.o.o., Hrvatska gospodarska komora, Zagreb, FINA – financijska agencija, Oskar – Centar za razvoj i kvalitetu, Zagreb i Oskar Edukos, Zagreb.

U okviru prvog dana simpozija 16.3.2022. održan je Okrugli stol na temu: „Uloga kvalitete u stabilizaciji lanaca opskrbe“, koji je moderirao prof. dr. sc. Krešimir Buntak. Panelisti Okruglog stola bili su: doc. dr. sc. Miroslav Drljača – HDMK, doc. dr. sc. Saša Petar – Sveučilište Sjever, izv. prof. dr. sc. Ines Dužević – Ekonomski fakultet u Zagrebu i dr. sc. Krunoslav Škrlec – Visoko gospodarsko učilište Križevci. Održan je sastanak Upravnog odbora MSEECQI koju čini petnaest institucija i organizacija iz deset zemalja. Na sastanku su podneseni izvještaji o učinjenom u proteklih godinu dana, od kojih su najznačajnije aktivnosti bile donošenje deklaracija o prihvaćanju „Manifesta kvalitete za 21. stoljeće“ koji je izdala IAQ – Inter-

national Academy for Quality (Međunarodna akademija za kvalitetu). Zahvaljujući angažmanu MSEECQI, Manifest je usvojen od većine članica MSEECQI, a tekst manifesta preveden je na jezike članica: Hrvatski, Mađarski, Poljski, Rumunjski, Ruski, Slovački, Srpski. Deklaracije o prihvaćanju Manifesta s prijevodom Manifesta na navedene jezike članica MSEEQCI nalaze se i na stranicama IAQ, što značajno doprinosi globalnoj vidljivosti organizacija članica MSEEQI. Slijedeća značajna aktivnost o kojoj je podnesen izvještaj na sjednici Upravnog odbora MSEECQI je implementacija novog EFQM modela u modele nacionalnih nagrada za kvalitetu zemalja iz kojih dolaze članice MSEECQI. Na kraju prvog dana simpozija organizator je za goste pripremio koktel dobrodošlice.

Drugog dana simpozija 17.3.2022. godine sudionicima se prigodnim govorom obratio predsjednik Organizacijskog odbora simpozija i Predsjednik HDMK doc. dr. sc. Miroslav Drljača. Nakon toga, po treći put je dodijeljena Nagrada dr. sc. Josip Čiček, za najbolji studentski rad iz područja sustava upravljanja. Nagradu je dobila Ivana Rod, redovna studentica Sveučilišta Sjever. Mentor pri izradi nagrađenog rada bio je prof. dr. sc. Krešimir Buntak. Nakon toga održana su izlaganja prispjelih recenziranih radova koji će biti objavljeni u Zborniku radova. Ukupno su zaprimljena 44 znanstvena i stručna rada. Na simpoziju je sudjelovalo 85 autora iz 18 zemalja svijeta, s četiri kontinenta: Argentine, Bosne i Hercegovine, Češke Republike, Finske, Hong Konga-Kina, Indije, Kine, Libanona, Mađarske, Poljske, Rumunjske, Rusije, SAD, Slovačke, Srbije, Tajlanda, Ujedinjenog Kraljevstva, Vijetnama i Hrvatske. Među autorima radova i sudionicima bili su studenti i profesori s brojnih sveučilišta, fakulteta i veleučilišta. Izlaganja na simpoziju bila su simultano prevedena s hrvatskog na engleski i obrnuto, a online prijenosom upravljala je profesionalna organizacija za online menadžment, tako da su sudionici u dvorani mogli vidjeti online sudionike širom svijeta, a online sudionici mogli su vidjeti svakog trenutka što se događa u dvorani. Sudionici simpozija prisutni u dvorani u Poreču bili su iz četiri zemlje: Bosne i Hercegovine, Poljske, Srbije i Hrvatske. U popodnevnom satima za sudionike simpozija organiziran je turistički razgled grada Poreča uz stručno vođenje. U večernjim satima organizirana je zajednička večera za sudionike simpozija u hotelu Diamant.

Trećeg dana simpozija 18.3.2022. nastavljen je rad u plenarnom dijelu simpozija izlaganjem znanstvenih i stručnih radova. Po završetku izlaganja, sudionicima simpozija obratio se doc. dr. sc. Miroslav Drljača, zahvalivši se svim autorima, recenzentima, članovima organizacijskog odbora, pokroviteljima, medijskim pokroviteljima, donatorima i sponzorima te gostima sudionicima i najavio idući, 24. međunarodni simpozij o kvaliteti, negdje u Hrvatskoj, 2023. godine, oko prvog dana proljeća. Zbornik radova simpozija bit će objavljen kao knjiga, CD i elektronički, naknadno. Nakon prezentiranih radova i održanih rasprava, Upravni odbor HDMK formulirao je slijedeće zaključke simpozija:

1. Razvoj društveno odgovornih praksi u poslovanju nije zamisliv bez usvajanja načela poslovne etike jer je prilikom donošenja poslovnih odluka potrebno uzeti u obzir utjecaj na sve ključne dionike: zaposlenike, kupce, vlasnike, dioničari, dobavljače i druge javnosti.
2. Virus SARS CoV-2 uzrokovao je pandemiju i pojavu karantene. Zbog toga su obrazovne ustanove bile primorane prijeći s kontaktne na online nastavu. Studenti su značajno zadovoljniji kontaktnom nastavom i smatraju da je kvalitetnija i da mogu lakše komunicirati s profesorom te da ih znatno bolje priprema za polaganje ispita, u odnosu na online nastavu.
3. Poljoprivreda je važna gospodarska grana svake države. Zbog toga je potrebno raditi na razvoju i digitalizaciji hrvatske poljoprivrede jer digitalna poljoprivreda je budućnost. Razinu kvalitete digitalizacije poljoprivrede treba stalno podizati, osobito središnji poljoprivredni informacijski sustav, s ciljem razvoja poljoprivrede koja je prerasla granice klasične i traži nova znanja i vještine, kao i inovacije u sustavu obrazovanja.
4. Kvaliteta 4.0, odnosno upravljanje kvalitetom uslijed četvrtke industrijske revolucije, bavi se procesom upravljanja velikim količinama podataka (big data), koristi algoritme preskriptivne analize za metriku kvalitete, bavi se učinkovitom vertikalnom, horizontalnom i cjelovitom (end-to-end) integracijom kvalitete 4.0, koristi digitalne alate radi stjecanja strateške prednosti, prenosi kontinuiranu inovativnost na zaposlenike, prilagođava se novim tehnološkim otkrićima radi stjecanja konkurentnosti, stvara novu organizacijsku kulturu i daje podršku vrhovnom menadžmentu u provođenju novih strategija.
5. Sve veći zamah dobiva nova rasprava na temu treba li “svrha” biti ispred profita. Konkurentsko okruženje je takvo da tjera lidere da prihvate složena i izazovna pitanja koja se odnose na zakonodavne, društvene i okolišne čimbenike. Sposobnost održavanja i natjecanja u ovom okruženju zahtijeva holistički pristup strategiji.
6. Klasični pristup auditu poboljšavanja zatvara organizaciju u okvire ispunjenja zahtjeva norme ISO 9001:2015 i sužava svrhu procesa kontinuiranog poboljšavanja koji ima široke konotacije. Trajni uspjeh organizacije treba biti rezultat procesa trajnog poboljšavanja što bi auditori trebali utvrditi kod auditiranja organizacije, a njihov izvještaj ukazati na stanje i put ka trajnom uspjehu. Da bi se to postiglo treba primijeniti suvremene metode i kriteriji dokazivanja trajnog uspjeha organizacije.
7. Hrvatski su izvoznici iznimno zainteresirani za državne mjere kojima bi se, između ostalih, poticala ulaganja u istraživanje i inovacije te digitalizaciju kako bi

se unaprijedila kvaliteta njihova poslovanja što bi rezultiralo povećanjem hrvatske konkurentnosti.

8. S povećanjem prihoda svjetske populacije, sve je veća potražnja za kvalitetnim proizvodima. Kretanje kvalitete poljoprivredno-prehrambenih proizvoda mijenja se s vremenom, skupinama ljudi, tehnološkim razvojem, promjenama u društvenom okruženju. Osim kvalitete proizvoda, za odluku potrošača o kupnji bitna je kvaliteta povezanih usluga poput pakiranja, dostave, ponašanja (ljubaznost) prodavača. Dva značajna društvena utjecaja na percepciju kvalitete u posljednje vrijeme su svjetska pandemija COVID-19 i posebno u Europi – nova Zajednička poljoprivredna politika (CAP) za razdoblje 2023.-27.
9. Postizanje klimatske neutralnosti i održivog kružnog gospodarstva s niskim emisijama ugljika moguće je ostvariti jedino sinergijom djelovanja između različitih sektora. Energetski sektor i dalje predstavlja najveći izvor emisija stakleničkih plinova pri čemu doprinosi s više od tri četvrtine ukupnih emisija. Prema načelima kružne ekonomije, upotreba otpadnog pepela drvene biomase (PDB) u građevnim proizvodima kao djelomična zamjena cementa ili agregata pokazuje veliki potencijal, budući da se tako smanjuje nastajanje otpada, povećava recikliranje i uporaba otpada.
10. Tjelesna pismenost izraz je koji se odnosi, s jedne strane na tjelesnu kompetenciju, motivaciju, samopouzdanje i znanje, a s druge strane, na uvažavanje i preuzimanje odgovornosti za svrhovite tjelesne aktivnosti tijekom cijeloga životnog vijeka. Sve to pridonosi kvaliteti života, odnosno razumijevanju načela integriranog zdravlja. Projekt WHO (Svjetske zdravstvene organizacija) „Zdravi grad“ ne obvezuje lokalne zajednice na mjerenje učinaka akcija koje provode s ciljem promicanja i poticanja tjelesne aktivnosti stanovnika, a nema ni spomena tjelesne pismenosti kao strateške odrednice.
11. Pareto (ABC) dijagram je grafička metoda za analizu pojava kojim se vrši rangiranje veličina/pojava ili pogrešaka i njihovih uzroka u padajućem redoslijedu. Može se primijeniti u sportu gdje je moguće identificirati problem i na osnovu dobivenih rezultata analize poduzimati korektivne aktivnosti za njihovo otklanjanje. Sportaši i sportski radnici koji razmišljaju 80/20 uspješni su.
12. Suvremeni svijet postaje kompliciraniji i brzo se mijenja. Digitalna revolucija i tehnološki napredak radikalno su utjecali na način na koji radimo i uspostavljamo odnose. Usporedo s globalnim promjenama i tekućim društvenim i generacijskim promjenama, promijenile su se i postojeće poslovne paradigme, a promijenio se i portret učinkovitog top menadžmenta. Tržište danas treba novi model kompetencija top menadžmenta. Od potencijalnih top menadžera se zahtijeva širok raspon društvenih vještina i visoka emocionalna inteligencija.

13. Automatizacija i robotizacija proizvodnih procesa postaje sve popularnija u gospodarstvu razvijenih zemalja, što znači likvidaciju nekih (procjena oko 45%) zanimanja do 2030. godine. Promjene tržišnih uvjeta dovode do promjene zahtjeva za kompetencijama zaposlenika.
14. Upravljanje kvalitetom sastavnica je svake organizacije, kombinacija međusobno povezanih alata i rješenja koja se mogu koristiti za doseg više razine kvalitete u prijevoznim uslugama. U području usluga prijevoza tereta kupci imaju izbor više vrsta prijevoznih usluga. Rezultati istraživanja pokazuju da su cestovni i željeznički prijevoz među najpoželjnijim vrstama prijevoza tereta.
15. Poduzeća koja posjeduju sustav upravljanja kvalitetom ISO 9001 donekle imaju bolje pokazatelje profitabilnosti. Poduzeća koja su ranije uvela sustav upravljanja kvalitetom ISO 9001 „otpornija“ su na pojavu krize 2020. godine uzrokovane pandemijom COVID-19, jer su im pokazatelji profitabilnosti bolji.
16. Pojmovi upravljanje kvalitetom i sustav upravljanja kvalitetom uspostavljeni su u međunarodnim normama ISO 9000. Upravljanje kvalitetom je problem organizacijskog upravljanja. No, već dugi niz godina primarni interes je osiguranje kvalitete, što je samo dio upravljanja kvalitetom koji se odnosi na zahtjeve za postizanje povjerenja među vanjskim kupcima. Kada je prepoznat sustavni pristup realizaciji upravljanja kvalitetom, stručnjaci za kvalitetu počeli su govoriti o sustavima kvalitete kao specijaliziranim sustavima za pitanja kvalitete u organizaciji. Međutim, to je prekinulo prirodnu vezu između upravljanja kvalitetom i upravljanja poslovanjem organizacije. Sada postoji trend da upravljanje kvalitetom treba biti integrirano kao organski besprijekoran dio poslovnog sustava organizacije, te stoga određeni sustav upravljanja kvalitetom više nije potreban. Međutim, upravljanje kvalitetom ostaje profesionalni ključni koncept za implementaciju kvalitete u svim organizacijama. U konačnici, sustav upravljanja kvalitetom predstavlja kvalitetno upravljanje organizacijom.
17. Svijet avijacije se mijenja. Zrakoplovi postaju autonomniji, povezaniji, inteligentniji i raznovrsniji. Putnici u zračnom prometu sve više očekuju ekološki prihvatljive, pametne i personalizirane opcije mobilnosti koje im omogućavaju da putuju neprimjetno i efikasno. Tehnologije, kao što su biometrija, interaktivna navigacija i umjetna inteligencija, nude beskontaktna rješenja i stoga su jednako relevantne u svijetu nakon COVID-19.
18. Troškovi kvalitete sadržani su u svim troškovima organizacije. Mogu ukazati na nedovoljno dobru kvalitetu upravljanja, odnosno kompetentnost menadžmenta. Budući da su logistički i prometni procesi zaduženi za osiguranje svih potrebnih resursa za normalno funkcioniranje društva, pojava troškova zbog ne kvalitete, a

koji su determinirani lošim mitigacijskim planovima, mogu rezultirati i povećanjem ukupne cijene koštanja proizvoda ili usluge.

19. Transformacija – i slični nazivi koji se koriste kako bi se odgovorilo na pitanje kako bi organizacije trebale pristupiti evoluciji s kojom se suočavaju – nije samo pitanje tehnologije. Posljedice transformacije gotovo su uvijek na kulturnoj sferi.
20. Uloga kvalitete u logistici od osobitog je značaja jer osigurava odvijanje lanaca opskrbe i doprinosi ravnoteži između ponude i potražnje kao jednom od temeljnih ekonomskih zakona. Ulogu kvalitete u logistici treba sagledavati, s jedne strane slojevito jer se radi o brojnim sudionicima i logističkim procesima, a s druge strane holistički, jer se radi o globalnim procesima, sa snažnim utjecajem na razinu kvalitete života svih na planeti.

Okvir za donošenje ovih zaključaka predstavljen je sudionicima 23. međunarodnog simpozija o kvaliteti prilikom zatvaranja simpozija 18.3.2022. godine, a zaključke je usvojio Upravni odbor HDMK na 6. sjednici održanoj 9.5.2022. godine u Zagrebu. U Zagrebu: 9.5.2022.

Conclusions of the 23rd International Symposium on Quality
held in Poreč, Croatia, 16th – 18th March 2022

The 23rd international symposium on quality organized by the Croatian Quality Managers Society (CQMS) was held in the traditional time (around the first day of spring) from 16th to 18th March 2022. in Poreč, at the Diamant Hotel. Due to the epidemiological situation, the symposium was held at the so-called hybrid way, so that in Poreč, in the hotel, around 45 participants took part physically, and the same number online, who got involved in the work of the symposium from four continents. The co-organizers of the symposium were: 1) MSEECQI – Middle and South East European Countries Quality Initiative; 2) Herzen State Pedagogical University, Faculty of Management, St. Petersburg, Russia; 3) Department of Production Engineering and Safety, Faculty of Management Czestochowa, University of Technology, Czestochowa, Poland; 4) University North, Varaždin – Koprivnica, Croatia; 5) University of Žilina, Žilina, Slovakia i 6) Juraj Dobrila University of Pula, Pula, Croatia.

The symposium was held under the working title,
“QUALITY - YESTERDAY, TODAY, TOMORROW”

The patrons of the symposium were: MSEECQI – Middle and Southeast European Countries Quality Initiative, Ministry of Economy and Sustainable Development, Croatian Chamber of Economy, Croatian Accreditation Agency, State Bureau of Metrology, Croatian Business Council for Sustainable Development, University of Zagreb, Juraj Dobrila University of Pula, Faculty of Economics and Business in Zagreb (Postgraduate specialist study in Quality Management), Croatian Quality Award Foundation. Media patrons were: Poslovni savjetnik, Suvremena.hr, Kvalitet & izvrsnost, Belgrade; Portal Kvalitet, Belgrade; PoslovniFM, scientific journal Production Engineering Archives, Poland. There were donors and sponsors: University North Varaždin – Koprivnica, Zračna luka Zagreb d.o.o., Gradska plinara Zagreb d.o.o., Zagreb; BDO Savjetovanje d.o.o., Croatian Chamber of Economy, Zagreb, FINA – financial agency, Oskar – Centre for development and quality, Zagreb i Oskar Edukos, Zagreb.

As part of the first day of the symposium on 16th March 2022 a Round table was held on the topic: “The role of quality in the stabilization of supply chains”, which was moderated by Prof. Krešimir Buntak, Ph.D. The panellists of the Round Table were: Assist. Prof. Miroslav Drljača, Ph.D. – CQMS, Assist. Prof. Saša Petar, Ph.D. – University North, Assoc. prof. Ines Dužević, Ph.D. – Faculty of Economics and Business in Zagreb and Krunoslav Škrlec, Ph.D. – University of Economics in Križevci. A Steering Committee meeting of the MSEECQI which consists of fifteen institutions and organizations from ten countries, was held. At the meeting, reports were submitted on what had been done in the past year, the most significant of which

was the adoption of declarations on the acceptance of the “Quality Manifesto for the 21st Century” issued by the IAQ - International Academy for Quality. Thanks to the involvement of MSEECCI, the “Quality Manifesto” was adopted by the majority of MSEECCI members, and the text of the Quality Manifesto was translated into the languages of the members: Croatian, Hungarian, Polish, Romanian, Russian, Slovak, Serbian. Declarations on the acceptance of the “Quality Manifesto” with the translation into the listed languages of MSEECCI members are also available on the IAQ website, which significantly contributes to the global visibility of MSEECCI member organizations. The next significant activity, which was reported on at the MSEECCI Steering Committee meeting, is the implementation of the new EFQM model in the national quality award models of the MSEECCI member countries. At the end of the first day of the symposium, the organizer prepared a welcome cocktail for the guests.

On the second day of the symposium, 17th March 2022 the president of the Organizing Committee of the Symposium and the President of CQMS, Assoc. Miroslav Drljača Ph. D had an appropriate speech. After that, for the third time, the Prize of Dr. sc. Josip Čiček, for the best student paper in the field of management systems, was awarded to Ivana Rod, a regular student at the University North, Croatia. The mentor for the award-winning paper was Prof. Krešimir Buntak, Ph. D. After that, there were presentations of received peer-reviewed papers that will be published in the Proceedings. A total of 44 scientific and professional papers were received. 85 authors from 19 countries of the world, from four continents participated in the symposium: Argentina, Bosnia and Herzegovina, Czech Republic, Finland, Hong Kong-China, India, China, Lebanon, Hungary, Poland, Romania, Russia, USA, Slovakia, Serbia, Thailand, the United Kingdom, Vietnam, and Croatia. Among the authors and participants were students and professors from numerous universities, colleges, and polytechnics. Presentations at the symposium were simultaneously translated from Croatian to English and vice versa, and the online broadcast was managed by a professional organization for online management, so that the participants in the hall could see online participants around the world, and the online participants could see at any moment what was happening in halls. Symposium participants present in the hall in Poreč were from four countries: Bosnia and Herzegovina, Poland, Serbia, and Croatia. In the afternoon, a guided tour of the city of Poreč was organized for the participants of the symposium. In the evening, a joint dinner was organized for the participants of the symposium at the Diamant Hotel.

On the third day of the symposium, March 18th, 2022, work continued in the plenary part of the symposium with the presentation of scientific and professional papers. After the presentation, the participants of the symposium were addressed by Assoc. Prof. Miroslav Drljača, Ph. D, thanking all the authors, reviewers, members of the Organizing Committee, patrons, media sponsors, donors and sponsors and guest

participants and announced the next, 24th international symposium on quality, somewhere in Croatia, in 2023, around the first day of spring.

Proceedings of the symposium will be published as a book, CD, and electronic version later. After the papers presented and the discussions held, the Board of Directors of CQMS formulated the following conclusions of the symposium:

1. The development of socially responsible practices in business is unthinkable without adopting the principles of business ethics because when making business decisions, it is necessary to consider the impact on all key stakeholders: employees, customers, owners, shareholders, suppliers and other members of the public.
2. The SARS CoV-2 virus caused a pandemic and the emergence of quarantine. Because of this, educational institutions were forced to switch from face-to-face to online classes. Students are significantly more satisfied with face-to-face teaching and believe that it is of higher quality and that they can communicate with the professor more easily, and that it prepares them much better for taking exams, compared to online teaching.
3. Agriculture is an important economic branch of every country. Therefore, it is necessary to work on the development and digitization of Croatian agriculture because digital agriculture is the future. The level of quality of digitization of agriculture should be constantly raised, especially the central agricultural information system, with the aim of developing agriculture that has outgrown the traditional boundaries and requires new knowledge and skills, as well as innovations in the education system.
4. Quality 4.0, i.e. quality management due to the fourth industrial revolution, deals with the process of managing large amounts of data (big data), uses prescriptive analysis algorithms for quality metrics, deals with effective vertical, horizontal and complete (end-to-end) integration of quality 4.0, uses digital tools to gain strategic advantage, transfers continuous innovation to employees, adapts to new technological discoveries in order to gain competitiveness, creates a new organizational culture and supports top management in implementing new strategies.
5. A new debate on whether “purpose” should come before profit is gaining momentum. The competitive environment is such that it forces leaders to accept complex and challenging issues related to legislative, social, and environmental factors. The ability to sustain and compete in this environment requires a holistic approach to strategy.
6. The classic approach to the improvement audit closes the organization within the framework of meeting the requirements of the ISO 9001:2015 standard and

narrows the purpose of the continuous improvement process, which has broad connotations. The lasting success of the organization should be the result of a process of permanent improvement, which the auditors should determine when auditing the organization, and their report should indicate the situation and the path to lasting success. To achieve this, modern methods, and criteria for proving the lasting success of the organization should be applied.

7. Croatian exporters are extremely interested in state measures that would, among other things, encourage investments in research and innovation and digitization to improve the quality of their business, which would result in an increase in Croatian competitiveness.
8. With the increase in the income of the world population, the demand for quality products is increasing. The movement of the quality of agricultural and food products changes with time, groups of people, technological development, changes in the social environment. In addition to the quality of the product, the quality of related services such as packaging, delivery, behaviour (courtesy) of the seller is important for the consumer's purchase decision. Two significant social influences on the perception of quality recently are the global COVID-19 pandemic and especially in Europe - the new Common Agricultural Policy (CAP) for the period 2023-27.
9. Achieving climate neutrality and a sustainable circular economy with low carbon emissions is only possible through synergy between different sectors. The energy sector continues to represent the largest source of greenhouse gas emissions, contributing more than three quarters of total emissions. According to the principles of the circular economy, the use of wood biomass waste ash (WBWA) in construction products as a partial replacement of cement or aggregate shows great potential, since it reduces waste generation, increases recycling and waste recovery.
10. Body literacy is a term that refers, on the one hand, to physical competence, motivation, self-confidence, and knowledge, and on the other hand, to appreciation and taking responsibility for purposeful physical activities throughout life. All this contributes to the quality of life, that is, to the understanding of the principles of integrated health. The WHO (World Health Organization) "Healthy City" project does not oblige local communities to measure the effects of the actions they carry out with the aim of promoting and encouraging the physical activity of residents, and there is no mention of physical literacy as a strategic determinant.
11. The Pareto (ABC) diagram is a graphical method for analysing phenomena by ranking sizes/phenomena or errors and their causes in descending order. It can

be applied in sports where it is possible to identify a problem and, based on the results of the analysis, take corrective actions to eliminate them. Athletes and sports workers who think 80/20 are successful.

12. The modern world is becoming more complicated and changing rapidly. The digital revolution and technological advances have radically affected the way we work and establish relationships. Along with global changes and ongoing social and generational changes, existing business paradigms have also changed, and the portrait of effective top management has also changed. The market today needs a new model of top management competencies. Potential top managers are required to have a wide range of social skills and high emotional intelligence.
13. Automation and robotization of production processes is becoming more and more popular in the economy of developed countries, which means the liquidation of some (estimated around 45%) occupations by 2030. Changes in market conditions lead to changes in the requirements for employee competencies.
14. Quality management is a component of every organization, a combination of interconnected tools and solutions that can be used to reach a higher level of quality in transportation services. In the area of cargo transportation services, customers have a choice of several types of transportation services. The research results show that road and rail transport are among the most preferred types of freight transport.
15. Companies that have an ISO 9001 quality management system have somewhat better profitability indicators. Companies that previously introduced the ISO 9001 quality management system are more “resistant” to the emergence of the crisis in 2020 caused by the COVID-19 pandemic, because their profitability indicators are better.
16. The terms quality management and quality management system are established in international standards ISO 9000. Quality management is a problem of organizational management. However, for many years the primary interest has been quality assurance, which is only the part of quality management that relates to the requirements for achieving trust among external customers. When a system approach to the implementation of quality management was recognized, quality experts began to talk about quality systems as specialized systems for quality issues in the organization. However, this broke the natural connection between quality management and the organization’s business management. Now there is a trend that quality management should be integrated as an organic seamless part of the organization’s business system, and therefore a specific quality management system is no longer necessary. However, quality management remains

a professional key concept for quality implementation in all organizations. Ultimately, the quality management system represents the quality management of the organization.

17. The world of aviation is changing. Airplanes are becoming more autonomous, more connected, more intelligent, and more versatile. Air travellers increasingly expect environmentally friendly, smart, and personalized mobility options that enable them to travel seamlessly and efficiently. Technologies such as biometrics, interactive navigation and artificial intelligence offer contactless solutions and are therefore equally relevant in a post-COVID-19 world.
18. Quality costs are included in all organization costs. I can point to insufficiently good management quality, that is, management competence. Since logistics and transport processes are responsible for ensuring all the necessary resources for the normal functioning of society, the appearance of costs due to poor quality, which are determined by poor mitigation plans, can result in an increase in the total cost price of the product or service.
19. Transformation – and similar names used to answer the question of how organizations should approach the evolution they face – is not just a question of technology. The consequences of transformation are almost always in the cultural sphere.
20. The role of quality in logistics is of particular importance because it ensures the development of supply chains and contributes to the balance between supply and demand as one of the fundamental economic laws. The role of quality in logistics should be viewed on the one hand, layered because it involves numerous participants and logistics processes, and on the other hand, holistically, because it is about global processes, with a strong influence on the quality of life of everyone on the planet.

The framework for making these conclusions was presented to the participants of the 23rd International Symposium on Quality at the closing of the symposium on March 18th, 2022, and the conclusions were adopted by the Board of Directors of CQMS at the 6th meeting held on May 9th, 2022, held in Zagreb.

Zagreb: May 9th, 2022

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